IZA Institute of Labor Economics

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DISCUSSION PAPER SERIES

IZA DP No. 15018

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Tilman H. Drerup
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Tilman H. Drerup
Bonn University

Matthias Wibral
Maastricht University and IZA

Christian Zimpelmann
IZA

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Skewness Expectations and Portfolio Choice*

Many models of investor behavior predict that investors prefer assets that they believe to have positively skewed return distributions. We provide a direct test of this prediction in a representative sample of the Dutch population. Using individuallevel data on return expectations for a broad index and a single stock, we show that portfolio allocations increase with the skewness of respondents' return expectations for the respective asset, controlling for other moments of a respondent's expectations and sociodemographic information. We also show that while an individual's expectations are correlated across assets, sociodemographics only capture very little of the substantial heterogeneity in expectations.

JEL Classification: D14, D84, G02, G11

Keywords: skewness, stock market expectations, portfolio choice, behavioral finance

Corresponding author:
Christian Zimpelmann
IZA
Schaumburg-Lippe-Straße 5-9
53113 Bonn
Germany
E-mail: zimpelmann@iza.org

* We thank Sebastian Ebert, Benjamin Enke, Hans-Martin von Gaudecker, Holger Gerhardt, Sebastian Kube, Farzad Saidi, Sebastian Schaube, Tobias Schmidt, Stefan Trautmann, Jana Willrodt, and Florian Zimmermann for helpful discussions. Valuable comments were received from audiences at the Behavioral Finance Working Group meeting at Queen Mary University, the CEAR/MRIC Behavioral Insurance Workshop Munich, the CERP workshop at Collegio Carlo Alberto, the INFER conference at Göttingen, Maastricht University, and the University of Bonn. Matthias Wibral gratefully acknowledges financial support from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement 749741. Support from the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through CRC-TR 224 (Project C01) is gratefully acknowledged by Christian Zimpelmann.

1 Introduction

Many models of investor behavior assume or imply that investors prefer assets with a positively skewed return distribution and dislike those with a negatively skewed return distribution (e.g., Arditti, 1967; Kraus and Litzenberger, 1976; Scott and Horvath, 1980; Brunnermeier et al., 2007; Barberis and Huang, 2008; Han et al., 2021; Dertwinkel-Kalt and Köster, 2019).[1] Such models can explain a wide range of important and puzzling patterns in investor behavior such as the tendency to underdiversify (e.g., Simkowitz and Beedles, 1978; Conine and Tamarkin, 1981; Mitton and Vorkink, 2007), the surprising popularity of technical analysis (Ebert and Hilpert, 2019), or the pricing of skewness in the cross-section of stock returns (e.g., Boyer et al., 2010). Given the potential explanatory power of a preference for skewness, it is critical to provide an empirical test of its relevance for investor behavior.

The key challenge for such a test lies in the fact that future returns to holding an asset are uncertain and investors have to form expectations about their distribution. A direct test of a preference for skewness in investor behavior therefore requires knowledge about the skewness of the *expected* return distribution at the level of the individual investor.[2] However, despite a recently growing interest in measuring investors' expectations and their relation to investment decisions (e.g., Drerup et al., 2017; Kuhnen and Miu, 2017; Fermand et al., 2020; Giglio et al., 2021), the skewness of investors' return expectations has so far received no attention. In this paper, we fill this gap using high-quality data on individual return expectations and portfolio choices from a series of repeated, financially incentivized experiments with a representative sample of the Dutch population. We characterize the heterogeneity in expected skewness and relate it to portfolio choice at the individual level, both in the cross-section and over time.

Our data stems from a series of experiments which we ran with the Dutch LISS panel. In the experiments, we employed an intuitive graphical interface to obtain a fine-grained estimate for the distribution of each respondent's return expectations for two risky assets, an index and a stock (Delavande and Rohwedder, 2008; Bellemare et al., 2012). We used these distributions to calculate estimates of the mean, standard deviation, and skewness of respondents' expectations. In a complementary portfolio

[1] See Ebert and Karehnke (2019) for a comprehensive discussion of skewness preferences in different theories of choice under risk.

[2] We will use the term "expected skewness" throughout the text to refer to the skewness of an individual's expected return distribution.

choice task, we asked respondents to allocate a fixed budget between the two risky assets and a savings account. To incentivize the belief elicitation procedure, we based respondents' payouts at the end of the experiment on the accuracy of their beliefs. Likewise, we tied respondents' payouts to the actual performance of their experimental portfolio at the end of the holding period, one year after the construction of the initial portfolio. Unannounced beforehand, we gave respondents the opportunity to update their beliefs and to change their portfolio allocations six months following the initial wave, adding a temporal dimension to the data.

Using data from these experiments, we tackle two questions: First, how skewed are individual investors' return expectations? Second, is there evidence for the most basic prediction of the models that posit a preference for skewness, i.e., a positive correlation between *individual* skewness expectations and investment decisions?

We find that respondents entertain very heterogeneous skewness expectations, disagreeing not only on its magnitude, but also on its sign. While some respondents expect quite positively skewed return distributions for an asset, others expect negatively skewed distributions with small chances of drastic losses. Our respondents expect higher levels of skewness than what is observed in historical data for both the stock and index. In line with previous research (e.g., Ameriks et al., 2019), respondents on average expect lower means and standard deviations of returns than historically observed.

Previous studies find that estimates of the probability that stocks will increase in value over the next year vary with socioeconomic characteristics (e.g., Hurd et al., 2011; Hudomiet et al., 2011; Kuhnen and Miu, 2017; Das et al., 2019). For example, respondents with a higher income tend to believe that it is more likely that the stock market will go up (e.g., Das et al., 2019) - a finding we replicate in our data set. Employing the LISS panel's rich background information, we therefore explore the determinants of respondent-level variation in stock market expectations. Differences in expected skewness could potentially explain why sociodemographic groups differ in their tendencies to hold positively skewed stocks, as documented, for example, by Kumar (2009). We find that stock market expectations seem to be intrapersonally stable but interpersonally highly variable (Dominitz and Manski, 2011). In other words, an individual respondent tends to expect similar levels of mean, standard deviation, and skewness for both of the assets; different respondents with similar sociodemographic attributes, however, tend to expect very different levels of these moments for the same asset. Systematic variation in skewness expectations thus seems to be an unlikely factor explaining sociodemographic variation in the propensity to hold specific stocks.

To assess whether investment behavior is consistent with the predictions of models that propose a preference for skewness, we follow two approaches. First, we regress respondents' initial investment in a given asset on the moments of respondents' stated expectations for the asset. Respondents' investments indeed increase with the skewness of the expected return distribution for each of the two assets. The estimated effect sizes are substantial. Our estimates suggest that an increase in the expected skewness by one standard deviation for either of the assets is associated with an increase of 3.67% and 4.83%, respectively, of the asset's unconditional average portfolio share in the sample. To put that into perspective, comparable increases in the expected mean increase the share invested into the assets by 15.46% and 13.49%.

In a second step, we exploit the repeated nature of the experiments. Using data from both the initial and the follow-up experiments six months later, we relate changes in the moments of the expectations for the asset at the individual level to changes in each asset's holdings. For the asset with more temporal variation in skewness expectations, i.e., the stock, we find a positive relation between the changes in the expected skewness of the return distribution and changes in the respondents' positions. In other words, we find that respondents adjust their portfolio position in the stock in a way that is consistent with a preference for skewness. Changes in the expected skewness have economically meaningful effects on respondents' portfolio allocations. Our estimates suggest that an increase in the change of the expected skewness by one standard deviation is associated with a predicted increase of 1.30 percentage points for the stock's share in the experimental portfolio. For comparison, an increase in the change of the mean expected return of the stock by one standard deviation is associated with an increase of approximately 1.54 percentage points in its share in the portfolio.

We also assess how much explanatory power we gain through the addition of skewness by comparing the adjusted R^2s in specifications that include mean, standard deviation, and skewness to the adjusted R^2s in specifications with only the mean and standard deviation of expected returns. The addition of skewness substantially raises the adjusted R^2s for regressions that include the stock's share or changes therein as the dependent variable. For example, almost one quarter of the temporal variation in respondents' stock shares that one of our models can explain is due to the addition of changes in skewness expectations.

In a set of additional analyses, we probe the robustness of our findings. We show that our results hold while accounting for risk aversion, a rich set of sociodemographic control variables, and variation in respondents' financial numeracy. Our results also hold when we obtain estimates of the moments by fitting a skew-normal distribution rather than using the method proposed in Bellemare et al. (2012), or when we restrict our attention to unimodal belief distributions.

Our analysis contributes to several strands of literature. First, it complements a growing literature exploring the importance of skewness for investor behavior and asset prices. The study of skewness preferences in the stock market faces the problem that investors' expected skewness is usually unknown. The existing empirical work uses an indirect approach to circumvent this problem by assuming that certain observable measures can serve as a proxy for expected skewness. Kumar (2009) and Barberis et al. (2016), for example, assume that investors form beliefs by extrapolating the skewness of past returns into the future. Bali et al. (2011) and Lin and Liu (2017) proxy expected skewness by the maximum return of a stock over a certain period in the past. Others have, in the spirit of rational expectations, used future returns (e.g., Mitton and Vorkink, 2007) or options market data (Conrad et al., 2013).

These indirect approaches face two challenges. First, there is no consensus on what the best proxy for expected skewness is and over which time horizon it should be calculated. Second, models incorporating a preference for skewness are models about *individual* behavior. However, indirect approaches proxy expected skewness at the *asset* level and thus do not take heterogeneous expectations for a given asset across investors into account.[3] A number of papers in this literature document a negative correlation between the respective proxy for the expected skewness of an asset and subsequent returns. It is commonly suggested that a preference for skewness at the individual level is the mechanism driving this outcome, but this has been questioned (Barinov, 2018). One of our contributions is that we substantiate this mechanism by directly measuring expected skewness and showing that higher expected skewness at the individual level is linked to higher investment in an asset. More generally, our findings align with recent work (e.g., Kuhnen and Miu, 2017; Das et al., 2019; Giglio et al., 2021) that

[3] It is important to note that even those studies which analyze the portfolio holdings of individual investors (e.g., Mitton and Vorkink, 2007; Kumar, 2009) use skewness proxies at the asset level. For example, Kumar (2009) uses past returns to identify lottery-type stocks with a high skewness. He finds that, at the aggregate level, socio-demographic characteristics which were found to correlate with lottery purchases in previous studies are correlated with purchases of stocks with a high skewness in past returns in a sample of online brokerage clients.

suggests that taking heterogeneity in expectations into account is an important and fruitful direction for future research.

Second, our paper contributes to the literature studying higher order risk preferences in controlled experiments (see Trautmann and van de Kuilen, 2018, for a review). A number of these studies find that subjects (ceteris paribus) prefer more positively skewed lotteries in simple binary choice tasks (e.g., Deck and Schlesinger, 2010; Ebert and Wiesen, 2011; Noussair et al., 2014; Ebert, 2015). However, these studies are by design mute on the role of expectations since probabilities, payoffs, and hence the skewness of the return distribution are known in these experiments.[4] Our contribution to this literature is that we extend the analysis to a situation in which returns are unknown.

Third, our findings also contribute to the literature on measuring stock market expectations. Due to the importance of stock market expectations as primitives of models of investor behavior, a substantial literature investigates how heterogeneous and accurate investors' expectations are and how they relate to portfolio choices (e.g., Vissing-Jorgensen, 2003; Dominitz and Manski, 2004; Kézdi and Willis, 2011; Hurd et al., 2011; Hudomiet et al., 2011; Hurd and Rohwedder, 2012; Amromin and Sharpe, 2014; Ameriks et al., 2019; Breunig et al., 2021; Drerup et al., 2017; Kuhnen and Miu, 2017; Das et al., 2019; Giglio et al., 2021). However, possibly due to the prominence of the classical mean–variance framework (e.g., Markowitz, 1952), the literature has characterized investors' subjective expectations using at most the first two moments. The most relevant paper for our study is a subsequent study by Giglio et al. (2021). They study beliefs and portfolio choice in a panel of wealthy individual investors. While they are especially concerned with the implications of (heterogeneity in) individual beliefs for macro-finance models, the most relevant finding for the context of our study is that the expected standard deviation of stock returns is not significantly correlated with the equity share in investors' portfolios once the expected probability of a stock market decline of more than 30% is controlled for. Our main contribution to the expectations literature is that we extend the study of stock market expectations to include skewness. The finding that respondents tend to expect similar levels of skewness for the two assets supports the notion of an interpersonally variable, but intrapersonally stable process of expectation formation as suggested by Dominitz and Manski (2011).

[4] See Becker et al. (2021) for a discussion of higher order risk attitudes in description- vs. experience-based decisions.

In addition, we differ methodologically from most of the literature by paying participants for the accuracy of their beliefs. Many qualitative features of our incentivized expectations (e.g., underestimation of mean returns) replicate those previously found without incentives, thus alleviating concerns about the reliability of the latter.

Finally, unlike almost all previous work, we link expectations to investments in particular assets rather than stock market participation overall. In this aspect, our paper is closely related to Breunig et al. (2021). In their portfolio choice experiment, subjects can invest in a stock whose return is drawn from the actual historical return distribution of the German DAX. They show that the mean of individual respondents' estimates for this distribution predicts investment in the experimental stock. However, they do not study expected skewness.

2 Data

2.1 Data Source

Our main source of data is the LISS (Longitudinal Internet Studies for the Social Sciences) panel of CentERdata at Tilburg University. The LISS panel is a representative sample of the Dutch-speaking population permanently residing in the Netherlands. It is based on a true probability sample of households drawn from the population register. Households are provided with a computer and an Internet connection if they can not participate otherwise. Overall, the panel consists of 4,500 households comprising 7,000 individuals who participate in monthly Internet surveys. Our experiments were embedded in these surveys. In addition, a longitudinal survey is fielded in the panel every year, covering a large variety of domains like work, education, income, housing, time use, political views, values, and personality. Due to the high level of detail, in particular on households' socioeconomic situation, data from the LISS panel and CentERdata have been used in a number of studies on investment behavior (e.g., Alessie et al., 2004; van Rooij et al., 2011; Noussair et al., 2014; von Gaudecker, 2015).

Our analyses employ data from a series of incentivized experiments. These experiments were conducted between August 2013 and November 2014. In our analyses, we restrict our attention to households who partook in August 2013, September 2013, and March 2014. The instructions and data for each wave can be found under https://www.dataarchive.lissdata.nl/study_units/view/576/ (parts 1–3). Within each household, the financial decision maker was asked to answer the questions. To ensure that all participants were at least minimally acquainted with financial decisions, households which did not report financial wealth in excess of €1,000 were excluded. We include households whose financial wealth was unknown.

Figure 1 shows the temporal sequence of our experiments. In August 2013, participants were asked about their beliefs regarding the performance of two risky assets until August 2014. In September 2013, participants were asked for a point prediction for the interest rate of a standard savings account. In addition, they had to allocate €100 between the two assets and a savings account, knowing that they would be paid according to the performance of this portfolio in August 2014.[5] In March 2014, participants were again asked about their beliefs regarding the performance of the two risky assets until August 2014, and they were also given the opportunity to rebalance their portfolio. This second part of the experiments was not announced beforehand. Thus, when stating their initial beliefs and forming their portfolios, participants did not know that they would be allowed to adjust both at a later time. Importantly, this implies that belief elicitations and portfolio choice at both points in time were incentivized.[6]

Table B.1 in the Internet Appendix provides an overview of response and attrition rates for the different points in time. Out of the 2,978 individuals invited in August 2013, 77.6% completed the first experiment. In total, 1,857 respondents completed all three experiments and comprise our main sample. The following sections describe the components of the experiments in more detail.

[5]The delay between belief elicitation and portfolio allocation was introduced for logistic reasons and to avoid an experimenter demand effect.

[6]Note that part of the data on stock market expectations that we use in this paper is also used in Drerup et al., 2017 and Zimpelmann, 2021 but in entirely different contexts. Neither Drerup et al., 2017 nor Zimpelmann, 2021 use the experimentally elicited investment data that is used in our paper.

Drerup et al., 2017 show that the explanatory power of beliefs for stock market participation is lessened for participants who have problems articulating precise statements about their expectations. They focus exclusively on mean and variance of participants' stated expectations and concentrate on participants' stock market participation as recorded in survey data at fixed points in time. In our study, we corroborate our static results from a fixed point in time with a dynamic analysis that purely relies on updates in beliefs and investments, arguably a more demanding test than static point-in-time analyses. Finally, while Drerup et al., 2017 show that the explanatory power of a canonical model of portfolio choice varies meaningfully between participants, our study provides strong evidence that this model may lack an important ingredient, the skewness of expected returns.

Zimpelmann, 2021 combines the expectation data for the AEX with administrative tax records. He shows that the expected return for the AEX is related to actual portfolio risk, measured by the share of risky financial assets of total financial assets. Notably, he neither examines skewness expectations nor does he use the expectation data for Philips and the experimental investment data.

Aug. 2013	Sep. 2013	Mar. 2014	Oct. / Nov. 2014
Beliefs for Aug. ’14: AEX, Philips	Beliefs for Aug. ’14: Return of savings account	Beliefs for Aug. ’14: AEX, Philips (update)	Payout: By accuracy
	Portfolio construction: €100 in AEX, Philips, savings account	Portfolio rebalancing	Payout: Portfolio value
Controls	Controls	Controls	Controls

Figure 1: Timeline

2.2 Experimental Assets and Time Horizon

Throughout, the experiments contained two risky financial assets: shares of Koninklijke Philips N.V. (“Philips” in the following) and an exchange-traded fund invested into the Amsterdam Exchange Index (“AEX”). Both assets were likely recognized by all respondents in the sample. Philips is one of the biggest Dutch companies, a popular brand for consumer electronics, and thus familiar to most if not all respondents in our sample. The same holds for the AEX, which is a broad and well-known index. As a benefit of employing real rather than artificial assets, the development of the assets’ actual prices provided a natural benchmark to incentivize respondents’ expectations (see below). The experiments included detailed descriptions of each asset (see Section A.1). In addition to shares of Philips and the AEX fund, the experiments also included a savings account. Savings accounts are likely well-known to all respondents in the sample. In the portfolio experiment, the savings account serves as a respondent’s essentially riskless investment option.

When asking respondents for their expectations and portfolio decisions, the end of the holding period was held fixed. Thus, whenever respondents were asked for their expectations for a given asset, they were asked for the expected distribution of values in August 2014. Likewise, respondents were asked to construct portfolios with an investment-horizon ending in August 2014.

2.3 Eliciting Expectations

To elicit respondents' expectations, the experiments relied on a methodology proposed in Delavande and Rohwedder (2008). The method employs a graphical interface and lets respondents describe their expectations in the form of a histogram. Each respondent's belief histogram in turn allows for a straightforward estimation of different moments of the respondent's belief distribution. Section A.2 of the Appendix provides screenshots accompanying the following description of the design.

In August 2013, each respondent was asked to imagine an investment of €100 each into shares of either Philips or the AEX fund. The respondent was then asked to think about the value of each of these investments in August 2014, one year into the future. Respondents were provided explicit details on the value that was asked for. For Philips, for example, they were told how to incorporate possible dividends should they be paid before August 2014. Next, respondents were asked to express their expectations using a graphical interface (see Figure A.1).

Using the interface, respondents could distribute a total of 100 balls across 8 distinct bins to express their confidence that the value of each asset would fall into certain intervals represented by each bin. The allocation of balls proceeded iteratively. Initially, the respondents were asked to distribute all 100 balls to two intervals, $(-\infty, 100]$ and $(100, \infty)$, to indicate their confidence that the value of their investment would fall below or above €100. Next, the interface asked respondents to redistribute all balls they had assigned to $(100, \infty)$ into two sub-intervals, $(100, 105]$ and $(105, \infty)$. This continued until respondents had allocated all balls to eight intervals. While the six interior intervals covered €5 ranges of possible values each, the two outer bins represented open intervals, $(-\infty, 85]$ and $(115, \infty)$.

Unannounced beforehand, respondents were given the chance to adjust their expectations using a slightly adapted version of the interface in March 2014 (see Figure A.2). To create a minimal amount of common knowledge, participants were informed about the performance of the respective asset since the last elicitation of beliefs before being given the opportunity to revise their beliefs. On average, the performance of the AEX was 5% (Philips 1.7%) between the first and second elicitation of beliefs. Participants did not receive any other information about the time course of the stock price over the interval since the last elicitation of beliefs. The new interface initially presented them with the distribution of expectations they had stated in August 2013. Below each bin, the interface now contained $+/-$ signs that allowed respondents to adjust the probability that the final value of the asset would fall into the respective bin.

To account for variation in respondents' expectations for the savings account, respondents were also asked to provide a point estimate for its rate of return. Section A.4 of the Appendix provides a detailed description of this part of the experiment and the distribution of point estimates in our sample.

An alternative way of eliciting expectations would have been to use a probabilistic question format (Manski, 2004). This approach relies on a series of questions of the form: "*What do you think is the percent chance that the return on asset X will be larger than value Y?*" The two approaches are equivalent in the sense that both can be used to estimate the third moment of respondents' expectations. In our view, however, the design proposed by Delavande and Rohwedder (2008) has two very important practical advantages. First, the answers to Manski-type probabilistic questions are often internally inconsistent (Binswanger and Salm, 2017). That is, many subjects violate monotonicity. Most studies exclude these subjects, leading to a substantial reduction in sample size and unwanted selection effects. Our design enables us to make use of the full sample. In addition, monotonicity violations are likely to become more severe or frequent as the number of questions asked increases. It would take seven questions to obtain the same resolution as our approach. Second, the design by Delavande and Rohwedder (2008) is intuitive and easy to understand which is especially important in a representative sample such as ours. The approach has been used successfully with samples of poor, illiterate subjects in developing countries (see Delavande et al., 2011, for a review).

2.4 Estimating the Moments of Respondents' Expectations

To obtain estimates for the entire distribution of a respondent's expectations and its moments, we followed a variant of the methodology suggested in Bellemare et al. (2012). First, we turned the histograms into discrete cumulative distribution functions of a respondent's expectations. For example, when a respondent put 5 balls into the bin $(-\infty, 85]$ and 5 more into $(85, 90]$, we set the value of the CDF at 85 and 90 to 0.05 and 0.10, respectively. Second, we connected each pair of neighboring points on this CDF through a monotonically increasing cubic polynomial (i.e., a cubic Hermite spline) to obtain an estimate of the CDF between two bin boundaries. Afterwards, we combined the resulting 8 polynomials into one continuous function to serve as our estimate for the entire distribution of beliefs. Basically, this method takes the discrete distribution of expectations and turns it into a smooth estimate of the continuous distribution by connecting all known points through suitably chosen polynomials.

After expressing this estimate in returns (i.e., after shifting the support by −100), we calculated the mean, standard deviation, and skewness of the expected return distributions. Specifically, for each respondent, each point in time at which expectations were elicited, and each asset, we calculated the expected mean μ as

$$\mu = \int_{r_{\min}}^{r_{\max}} r f(r) \mathrm{d}r,$$

the expected standard deviation σ as

$$\sigma = \left(\int_{r_{\min}}^{r_{\max}} (r-\mu)^2 f(r) \mathrm{d}r \right)^{1/2},$$

and the expected skewness γ as

$$\gamma = \int_{r_{\min}}^{r_{\max}} \left(\frac{r-\mu}{\sigma} \right)^3 f(r) \mathrm{d}r,$$

by integrating over the entire support of our estimate for the distribution of expected returns r. We set the limits of integration ($r_{\min}$ and $r_{\max}$), i.e., the outer bounds of the extreme bins, to the 5th and 95th percentile of the distribution of the respective asset's historical returns. We obtain qualitatively similar results when we pick more extreme outer bounds.

Working with our estimates for August 2013 and March 2014, we also calculated the differences in expected moments between these two points in time. That is, for each asset we calculated

$$\Delta\mu = \mu^{\text{Mar14}} - \mu^{\text{Aug13}},$$

$$\Delta\sigma = \sigma^{\text{Mar14}} - \sigma^{\text{Aug13}},$$

and

$$\Delta\gamma = \gamma^{\text{Mar14}} - \gamma^{\text{Aug13}}.$$

In Section B.3.1 of the Internet Appendix, we provide a more detailed description of the method, including its technical implementation. We also show some estimated distributions and their moments.

The choice of method is the result of several trade-offs. Evidently, time constraints prevented asking respondents to distribute, say, 10,000 balls across 100 bins to obtain an even more fine-grained estimate for the discrete distribution of expected returns. The interpolation of the distribution between a reduced set of known points seems a natural alternative. At the same time, there are, of course, several ways to interpolate this distribution. An alternative to our approach would have been to impose a parametric shape for the entire distribution and to obtain estimates of its moments based on the assumed functional form. Our approach is a little more flexible in that it can handle varying distributional shapes between bins, thus allowing for less "well-behaved" beliefs. Also, we felt more comfortable not imposing a parametric distribution to avoid potential problems arising from misspecification.

Nevertheless, estimating the moments of the expected return distribution in this particular way is not essential to our analysis. As we show in the robustness section, our results are unaffected when we follow a parametric approach by fitting a skew-normal distribution to obtain estimates of respondents' belief distributions and their moments.

2.5 Portfolio Choice Experiment

The first round of the portfolio choice experiment was fielded in September 2013. In the experiment, the same set of respondents that was initially surveyed for their expectations was asked to invest a total amount of €100 into nonnegative positions of the AEX index fund, shares of Philips, and a savings account for a one-year investment horizon. Respondents were told that the value of each asset position would be tied to the actual return of the asset. A decline in the value of the AEX between September 2013 and August 2014, for example, would have reduced the value of the AEX share in a portfolio at the end of the experiment. To facilitate portfolio construction, an intuitive graphical interface was shown to respondents (see Figure A.6 in the Appendix). The interface allowed respondents to select and adjust individual portfolio positions by moving sliders up and down. They could only proceed with the survey once they had allocated an amount of exactly €100.

Unannounced beforehand, respondents were allowed to adjust their portfolio compositions in March 2014. First, they were presented with the portfolio they had initially chosen, adjusted for intermediate returns between September 2013 and March 2014. Respondents could then adjust the portfolio's positions. Again, respondents were required to allocate the full value of the portfolio, which now varied between respondents, before they were allowed to proceed with the survey.

2.6 Additional Variables

Our analyses employ a number of control variables. From the LISS background panel, we obtain information on respondents' gender, marital status, children, age, financial wealth, income, and education (for definitions, see Section A.6 of the Appendix). Table 1 breaks down the sample in terms of these characteristics. The "Preference Survey Module" of Falk et al. (2016) was employed to obtain measures for a respondent's level of risk aversion (see Section A.7 for detailed results).

2.7 Incentives

Recent findings (e.g., Palfrey and Wang, 2009; Gächter and Renner, 2010; Wang, 2011) suggest that financial incentives can lead to more truthful reporting of beliefs. The elicitation of beliefs was incentivized using the binarized scoring rule of Hossain and

Table 1: Sample description

	Avg. / Fraction of sample
Female	0.47
Net income $>$ €2500	0.45
Net income missing	0.07
Financial wealth $\in$ (€10000, €30000]	0.27
Financial wealth $\in$ (€30000, ∞)	0.27
Financial wealth missing	0.18
High education	0.37
$30 < \text{Age} \leq 50$	0.29
$50 < \text{Age} \leq 65$	0.35
$\text{Age} > 65$	0.31
Married	0.59
Has children	0.28
N	1,857

Sources: LISS panel / own calculations. The table shows the fractions of our sample that belong to different sociodemographic groups.

Okui (2013). They developed this scoring rule to address the concern that risk averse individuals have an incentive to report less dispersed beliefs under the often used quadratic scoring rule. Under the binarized scoring rule, the quadratic score does not directly translate into a payoff and instead generates a chance of winning a high rather than a low fixed prize. To this end, we first randomly drew one of the two assets for each respondent. We then calculated the following sum for the chosen asset:

$$\sum_{i=1}^{8}(100 \times \mathbb{1}_i - b_i)^2.$$

b_i was the number of balls in bin $i \in 1, ..., 8$ and $\mathbb{1}_i$ equalled 1 if the realized value of a €100 investment fell into the respective bin (and 0 otherwise). The sum thus reflected how far the elicited belief distribution was from the actual value. Next, we checked whether the sum of squared deviations fell above or below a randomly drawn number from a uniform distribution ($U[1, 20.000]$). If it was larger, a participant would receive €100 conditional on being selected for payment.[7]

As is common practice with large samples like ours, we randomly selected one in ten participants for payment in October 2014. To ensure that subjects had incentives to thruthfully report their expectations in August 2013, we did not tell them that they would be able to adjust their expectations in March 2014.

In the portfolio construction task, 1 in 10 respondents was independently drawn to receive the value of the portfolio at the end of the experiment. Again, we did initially not tell subjects that they would be able to adjust their portfolios. The random draws for the belief elicitation task and the portfolio choice task were independent.

Incentives were based on expectations and portfolio decisions from March 2014. This ensured that respondents had incentives to update both. In the belief elicitation task, the average respondent earned €39.66 conditional on being selected for payment (unconditional earnings €3.98). The average portfolio value of respondents being selected for payment in the portfolio task equaled €104.42 (unconditional earnings €9.62).

[7]Consider the example that a participant allocated 50 balls into the bin in which the actual return realization lay and 25 balls each in two other bins. The squared deviation would thus be equal to $50^2 + (-25)^2 + (-25)^2 = 3750$. The chance of winning the €100 conditional on being selected for payment was thus $((20000 - 3750)/20000) = 0.81$.

3 Expected Skewness: Heterogeneity and Determinants

This section begins with descriptive statistics of return expectations, focusing on the distribution of the skewness of respondents' expected return distributions. We then turn to possible determinants of variation in skewness expectations.

Figure 2 presents the cross-sectional distributions of the skewness parameters of respondents' return expectations for the AEX and Philips.[8] Table 2 shows several characteristics of these distributions alongside information on the first and second moments. The dashed lines in the figures present the skewness of the assets' historical return distributions, also shown in the last column of the table (for their calculation, see Section B.4 of the Internet Appendix).

One aspect stands out in particular. There is a lot of heterogeneity in respondents' skewness expectations. For the AEX, the average skewness of respondents' return expectations is 0.32 with a standard deviation of 1.07. For Philips, the average skewness is 1.66 with a standard deviation of 1.75. Thus, for both assets there is substantial variation in the skewness of respondents' return expectations, though the skewness of expectations for Philips seems more variable across respondents. Interestingly, respondents do not only disagree on the size of the expected skewness, but also on its sign. For example, about 62% expect a positively skewed return distribution for the AEX, whereas 38% expect the opposite. Put differently, there are some respondents who expect the AEX to offer small chances of large gains, while others expect small chances of large losses. For Philips, with 83% of respondents expecting a positively skewed return distribution, there seems to be less disagreement on the sign of the skew.

Relative to the skewness of the historical distributions of both assets' returns, our respondents' expectations tend to be comparably high. For example, while the historical distribution of AEX returns had a skewness of -0.33, respondents in the sample on average expect a return distribution with a skewness of 0.32. In general, only few of respondents' expected distributions can be considered similarly skewed as historical distributions, though the skewness parameters of the assets' historical distributions fall within the distributions of skewness expectations across respondents.

Taken together, respondents' skewness expectations are highly heterogeneous. While many respondents expect the assets to offer quite positively skewed payoffs, some do

[8] Similar figures for the first two moments can be found in Section B.3.2 of the Internet Appendix.

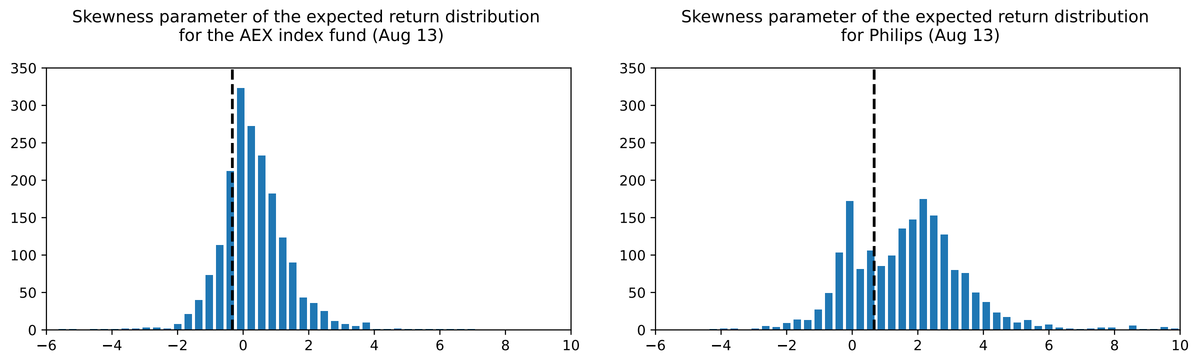

Figure 2: Distribution of the skewness parameters of the expected return distributions

Sources: LISS panel / yahoo! finance / Statistics Netherlands / own calculations. Distribution of the skewness parameters of the expected return distributions for an investment in the AEX index fund (left) and Philips (right) between August 2013 and August 2014. Figure B.4 of the Internet Appendix contains the distribution of skewness expectations in March 2014.

Table 2: Distribution of the estimated moments of the expected return distributions

	Mean	S.d.	Min.	P10	P30	P50	P70	P90	Max.	Historical
μ_{AEX}	2.56	6.29	−31.93	−2.60	0.23	1.88	3.86	8.64	33.30	5.57
σ_{AEX}	7.54	3.27	1.12	3.46	5.81	7.34	8.88	11.57	27.39	25.53
γ_{AEX}	0.32	1.07	−5.52	−0.79	−0.16	0.22	0.70	1.55	6.80	−0.33
μ_{Philips}	4.45	10.35	−31.89	−2.15	0.50	2.35	4.95	12.08	69.19	16.12
σ_{Philips}	10.25	5.99	1.12	3.32	6.78	9.57	12.19	18.11	37.65	45.61
γ_{Philips}	1.66	1.75	−4.21	−0.37	0.59	1.72	2.45	3.61	9.88	0.67

Sources: LISS panel / yahoo! finance / Statistics Netherlands / own calculations. The table shows characteristics for the distribution of the moments of respondents' expectations for the 1-year returns of the AEX (top three rows) and Philips (bottom three rows) in August 2013. The last column shows the respective historical moment, i.e., the moment of the empirical distribution of 1-year returns (see Section B.4 in the Appendix).

not. At the same time, our results suggest that historical values of skewness provide only poor proxies for the skewness of most respondents' return expectations.

The statistics on the first two moments of respondents' expectations, shown in Table 2, can be used for a quality check of our data. In line with recent work in which the elicitation of beliefs was not incentivized, we find that respondents' expected returns

(Giglio et al., 2021; but see Breunig et al., 2021) and standard deviations (Ameriks et al., 2019) are very heterogenous and they tend to be lower than the historical averages.[9]

We next turn to the analysis of what drives skewness expectations. We have no strong priors regarding how expectations might differ between different groups of respondents. We therefore focus on standard characteristics that have been considered as determinants of subjective stock market expectations in prior work (e.g., Hurd et al., 2011): gender, age, education, income, financial wealth, marital status, and having children. Finding systematic differences in skewness expectations would, in combination with a preference for skewness, provide a potential explanation why sociodemographic groups differ in their tendencies to hold positively skewed stocks as it has been documented, for example, in Kumar (2009).

Table 3 shows regressions of respondents' expected skewness for each asset on these potential determinants. The regressions do a poor job at explaining variation in expected skewness. The R^2s are 0.20% and 0.30% in the regressions and, with the exception of one age dummy in each and the dummy for having children in the AEX regression, none of the covariates shows up significantly. Section B.3.4 in the Internet Appendix shows that the same holds when we look at pairwise correlations between expected skewness and the above variables or when we add addtional characteristics including risk aversion, financial numeracy, and the source of financial advice. For both the AEX and Philips, we find that skewness expectations exhibit very low pairwise correlations with sociodemographic variables and other measures.

Several aspects of the data suggest that this is not due to the specifics of the method we employ to measure respondents' expectations or due to noise in the data. First, Section B.3.4 in the Internet Appendix shows that the observed patterns in the mean and standard deviation of respondents' expectations conform to results from prior work in many regards (e.g., Dominitz and Manski, 2004; Hurd, 2009; Hurd et al., 2011). For example, we find that male respondents and those who report more financial wealth tend to have a higher mean estimate for the AEX. In line with Giglio et al. (2021), we also find that R^2 tends to be quite low in these regressions.

Second, respondents seem fairly consistent in their expectations across assets. In September 2013, the pairwise correlations between the mean, standard deviation, and

[9]This also becomes clear from a comparison of the historical distribution of the respective assets' returns to the average probabilities expected by our respondents in Figure A.3 and Figure A.4 in the Appendix. A Chi-Square test confirms that the historical distribution is indeed different from the average distribution of participants' expectations for each asset ($p < 0.001$).

Table 3: Determinants of skewness expectations

	Expected Skewness	
	AEX (1)	Philips (2)
Constant	0.40***	1.45***
	(0.10)	(0.16)
Female	−0.05	0.11
	(0.05)	(0.09)
Net income > €2500	−0.03	0.05
	(0.06)	(0.09)
Net income missing	−0.07	−0.05
	(0.10)	(0.19)
Financial wealth $\in$ (€10000, €30000]	0.00	−0.05
	(0.07)	(0.11)
Financial wealth $\in$ (€30000, ∞)	0.07	−0.07
	(0.07)	(0.11)
Financial wealth missing	0.00	−0.10
	(0.08)	(0.12)
High education	−0.08	−0.02
	(0.06)	(0.09)
$30 < \text{Age} \leq 50$	−0.17*	−0.02
	(0.10)	(0.16)
$50 < \text{Age} \leq 65$	−0.03	0.21
	(0.10)	(0.15)
Age > 65	0.05	0.41***
	(0.10)	(0.16)
Married	−0.03	−0.05
	(0.06)	(0.09)
Has children	0.14**	0.10
	(0.07)	(0.11)
Observations	1,857	1,857
Adjusted R^2 (%)	0.20	0.30

Sources: LISS panel / own calculations. The table shows cross-sectional regressions of the skewness of the expected return distributions in August 2013 for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for all covariates. Heteroskedasticity-robust standard errors are reported in parentheses. Table B.8 and Table B.9 show analogous results for the mean and the standard deviation of the expected return distributions.

skewness of respondents' expectations for the AEX and Philips were 0.41, 0.47, and 0.14, respectively (see Section B.3.4 in the Internet Appendix). In March 2014, the same correlations were 0.46, 0.54, and 0.16. Put differently, respondents whose expectations tend to have higher means, standard deviations, or skewness for one asset also tend to have higher values for the other.

One concern here is that these correlations might be driven by a lack of understanding or the specifics of our elicitation method. To assess whether this might be the case, we compared the correlations for respondents with low and high levels of financial literacy (see Online Appendix B.2.1 for additional information). We find that the correlations for the three moments are stronger for high literacy participants with correlations of 0.43 vs. 0.39 for the mean, 0.48 vs. 0.43 for the standard deviation, and 0.14 vs. 0.11 for the skewness of respondents' expectations. Taken together, these results indicate that the relative consistency in expectations is not driven by a lack of understanding on the respondents' side.

In general, we consider it unlikely that the method should pick up this consistency but at the same time perturb the measured expectations enough to obscure underlying determinants. The low explanatory power of our observables also aligns with the result of Giglio et al. (2021) that individual fixed effects drive most of the *temporal* variation in beliefs about mean stock market returns. Third, data on respondents' expectations from this experiment has been shown to predict behavior in the field. Drerup et al. (2017) show that μ_{AEX} and σ_{AEX} predict stock market participation decisions as suggested by standard models. Finally, as we will see in the next section, variation in expectations also predicts variation in experimental behavior.

As our final analysis of heterogeneity in and determinants of beliefs, we take a closer look at whether and how participants changed their beliefs at the second elicitation in March 2014. Table B.2 of the Online Appendix provides information about the distribution of changes in participants' beliefs for the AEX and Philips. While the expected return for the AEX increases and the one for Philips decreases, participants slightly reduce their expected variance and skewness for both assets. This could reflect the fact that the period between the two belief elicitations was a period of relative stability in the stock market during which the AEX outperformed Philips. In terms of portfolio shares, the share invested in the AEX goes up by 3 percentage points (8.6%), the share invested in Philips goes down by 0.6 percentage points (2%), and the share held in the savings account decreases by 2.4 percentage points (7.6%).

In Table B.3 we provide an overview of the share of participants that increase, decrease, or do not change their beliefs about mean, standard deviation, and skewness of the two assets. The table shows that only slightly more than 50% of participants adjusted their beliefs. To develop a better understanding of what drove expectation adjustments, we regress changes in the mean, standard deviation, and skewness of expectations over time (either as an indicator for "Any change" or as a continuous outcome) on our set of control variables and additional variables that could proxy access to or understanding of financial information. These variables (elicited in the surveys in August 2013 and October 2014) include a measure of financial numeracy, indicators for the main source of advice in financial decisions (see Appendix B.2 for a description of those two variables), as well as an indicator if the participant held any stocks or funds. Tables B.16, B.17, and B.18 show that older people, those with higher financial literacy, and those whose main source of financial advice is the Internet (compared to "Professional") are more likely to change their beliefs. However, these variables do not predict the direction of the change. Our findings are in line with the analysis in Giglio et al. (2021). They find that while individuals tend to have very large and persistent differences in their views, which strongly dominate the time variation in beliefs, observable individual characteristics have little explanatory power for beliefs.

Finally, Table B.4 and Table B.5 cross-tabulate changes in beliefs and portfolios for the two different assets. Almost 40% of participants neither change their beliefs nor their portfolio shares, while a little more than 30% change both. Roughly 20% change their beliefs but not their portfolio, and 10% change their portfolios but not their beliefs. The high share of participants who do not change their beliefs represents a challenge for the dynamic analysis.[10]

4 Heterogeneity in Expected Skewness and Portfolio Choice

When constructing their portfolios in September 2013, respondents favored the AEX over investments in Philips or the savings account, with average fractions of 35%, 33%,

[10]Our findings for the dynamic regressions reported below also hold if we limit the sample to those participants who did change their beliefs.

and 32%, respectively.[11] This tendency became more pronounced in March 2014 with the average portfolio shares changing to 38% in the AEX, 32% in Philips, and 30% in the savings account. There was substantial heterogeneity in both how respondents composed their portfolios and in how they adjusted them over time. The standard deviation of the share invested into Philips in September 2013, for example, was 24%.

In this section, we relate respondents' stated expectations to their behavior in the portfolio choice experiment. In this section, we relate respondents' stated expectations to their behavior in the portfolio choice experiment. Before we present the results, we briefly discuss our choice of regression setup. Much of the literature on the role of stock market expectations rests on the mean-variance paradigm of classical portfolio choice theory (Markowitz, 1952 and Merton, 1969). Accordingly, the focus often lies on regressions relating expected mean (and variance) for a broad index of stocks to stock market participation or the share of financial wealth invested in stocks. Unfortunately, "Once we move away from the first and second moment of returns, [...] we lose a simple asset pricing model that can be used to benchmark the quantitative relationship between beliefs and portfolios.´´ (Giglio et al., 2021) Indeed, the literature on skewness preferences like Mitton and Vorkink (2007) and Barberis and Huang (2008) uses very different approaches to motivate skewness preferences, neither of which lends itself to a straightforward empirical test with our data.[12] For example, both models study a situation in which only *one* asset has skewed returns and the returns of this asset are independent from the returns of the other assets. In our empirical specification, we therefore take inspiration from the existing literature on stock market expectations. Similar to this literature, we use linear regression specifications where portfolio allocation decisions present the outcome variables and moments of the belief distribution enter as covariates. Absent an easily tractable or commonly agreed upon framework,

[11]While these averages are suggestive of a $1/N$ heuristic, we find that very few portfolios are consistent with such a decision rule. Less than 3% of respondents (52 of 1,857) invest between 28.33% and 38.33% (= 33.33% $\pm$ 5%) of their total portfolio value in each of the assets in September 2013. We refer the interested reader to Section A.5.2 of the Appendix for a more detailed description of respondents' portfolio allocation decisions.

[12]Mitton and Vorkink (2007) assume heterogeneity in investor preferences. Some investors have classical Mean-Variance preferences and some investors have Mean-Variance-Skewness preferences. In Barberis and Huang (2008), skewness preferences arise from cumulative prospect theory, in particular, the tendency to overweight the tails of return distributions. In both models, a group of investors in the market holds positively skewed positions at the expense of underdiversification such that skewness is priced in equilibrium. The intuition is that a skewed asset can add a large amount of skewness to the investor's portfolio and thus is more valuable to them which implies that they require a lower expected return to hold it.

this particular form seems the most appropriate choice as it allows for a straightforward comparison to the extant literature on lower moments and is arguably the most parsimonious specification to start with. In later sections, we show that we obtain similar results under alternative specifications. Using this basic setup, we approach the question of how skewed return expectations relate to investment decisions in two different ways: First, we explore the contemporary association between a participant's expectations concerning the skewness of an asset's return distribution and the share invested into the same asset in the portfolio choice experiment. Second, we exploit the repeated nature of our experiments and link variation in a respondent's expected skewness between August 2013 and March 2014 to variation in investment shares between September 2013 and March 2014. Thus, we assess the potential relevance of preferences for skewness both through the relation between expectations and investments at a given point in time as well as through the relation between changes in expectations and changes in investment decisions over time.

We begin the presentation of results in Table 4. The table shows regression of portfolio shares for the AEX (columns 1–3) and Philips (columns 4–6) on different moments of the expected distribution of returns and a measure of risk aversion (described in Section A.7). All specifications include controls for gender, age, education, marital status, children, income, and financial wealth. To maintain brevity, we only report the coefficients of these controls in Table B.19 of the Internet Appendix and focus on the expectation variables here. In the first column of Table 4, we show the results of regressing the share invested into the AEX only on the first two moments of expectations for the AEX. In the second column, we add the skewness of the expected return distribution for the AEX. In the third column, we add the point estimate for the return of the savings account and the moments of Philips' expected return distribution to control for the subjective attractiveness of alternative assets.

The coefficient of the mean expected return, μ_{AEX}, is positive and highly significant in columns 1, 2, and 3. Respondents' shares invested into the AEX thus increase with their mean return expectation, suggesting a positive preference for higher mean returns. The effect is economically substantial. An increase in the expected mean return for the AEX by one standard deviation increases the AEX's fraction in the experimental portfolio by approximately 5.41 percentage points or about 15.46% of the unconditional

Table 4: Expectations and Portfolio Choice

	Portfolio Share					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	27.62***	26.80***	28.86***	28.49***	27.56***	29.55***
	(3.30)	(3.33)	(3.42)	(2.83)	(2.85)	(3.08)
μ_{AEX}	0.70***	0.68***	0.87***			−0.22*
	(0.11)	(0.11)	(0.11)			(0.12)
σ_{AEX}	−0.02	0.03	0.27			−0.12
	(0.19)	(0.19)	(0.22)			(0.22)
γ_{AEX}		1.07*	1.20**			0.33
		(0.56)	(0.56)			(0.60)
μ_{Philips}			−0.24***	0.36***	0.38***	0.43***
			(0.09)	(0.09)	(0.09)	(0.09)
σ_{Philips}			−0.19	0.15	0.11	0.15
			(0.14)	(0.12)	(0.12)	(0.14)
γ_{Philips}			0.17		0.91***	0.91***
			(0.33)		(0.30)	(0.30)
Exp. return for savings account			−0.16			−0.25***
			(0.10)			(0.10)
Risk aversion	−2.48***	−2.51***	−2.45***	−3.28***	−3.26***	−3.45***
	(0.62)	(0.62)	(0.62)	(0.59)	(0.59)	(0.59)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	10.07	10.20	11.40	6.02	6.39	6.77

Sources: LISS panel and own calculations. The table contains OLS regressions of the share invested into the AEX (columns 1–3) and Philips (columns 4–6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, and financial wealth. The missing coefficients are shown in Section B.5 of the Appendix. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

average of the share invested into the AEX.[13] Put differently, an increase in the expected mean return by one percentage point increases the share invested into the AEX index fund by 0.7 percentage points. The size of this coefficient is remarkably close to the estimates of Giglio et al. (2021). The standard deviation of the expected distribution, σ_{AEX}, does not enter significantly in any of the specifications. Thus, how much the average respondent invests into the AEX seems unaffected by the expected riskiness of the AEX's future returns in terms of their expected standard deviation. This finding is also in line with the findings of Breunig et al. (2021) and Giglio et al. (2021).

[13] All statements concerning effect sizes are based on the summary statistics presented in Table 2 and the regression coefficients obtained through specifications including the full set of controls.

The coefficient of the expected skewness, γ_{AEX}, is positive and significant with p-values below 0.10 and 0.05 in both column 2 and 3. Respondents expecting a more positively skewed return distribution thus invest larger shares of their portfolios into the AEX, suggesting a preference for higher skewness. The effect is again economically meaningful. An increase in the skewness of the expected return distribution for the AEX by one standard deviation is associated with an increase of approximately 1.28 percentage points in the predicted share invested into the AEX or 3.67% of the unconditional sample average of this share. Variation in expected skewness thus has more than 1/5 of the effect size of comparable variation in the expected mean. The addition of skewness increases the adjusted R^2 moderately from 10.13% in column 1 to 10.26% in column 2. As expected, the coefficient for the mean return expectation for Philips in column 3 is negative and significant.

Columns 4–6 show analogous regression results for respondents' investments in Philips. The results provide strong confirmation of the findings for the AEX. The coefficient of the mean expected return for Philips, μ_{Philips}, is positive and highly significant in all three specifications. The standard deviation, σ_{Philips}, again enters nonsignificantly. The coefficient of the expected skewness, γ_{Philips}, is positive and significant with p-values of less than 0.01 in both column 5 and 6. The results for investments in Philips are thus also consistent with a positive preference for both higher mean returns and more skewed return distributions, whereas they do not suggest any preference concerning standard deviations. The economic magnitudes of the effects are remarkably similar to those of the effects associated with the AEX. For Philips, an increase in either the mean or skewness of the expected return distribution by one standard deviation increases the predicted share invested into Philips by approximately 4.45 and 1.59 percentage points or about 13.49% and 4.83% of the average Philips share in the sample. Thus, with respect to investments in Philips, the relative effect size associated with variation in skewness is more than 1/3 of the effect of the mean. Adding skewness increases the R^2 from 6.03% in column 4 to 6.40% in column 5.

Two other findings are worth pointing out. First, risk aversion is associated with reduced investment in both risky assets. Second, note that investment into an asset is negatively correlated with the expected mean for the other asset but not with the other asset's skewness. A theoretical framework which might help to evaluate this finding has only been developed very recently. In contrast to the models mentioned above, Beddock and Karehnke, 2021 study a setting with two skewed risks. Their analysis highlights the role that correlation in the returns of the two skewed assets plays in the trade-off between diversification and skewness. Given the assumptions concerning the return distributions and utility functions in Beddock and Karehnke, 2021, an increase in one asset's skewness decreases the amount invested into the other asset when the two assets are positively correlated. Demands for the two skewed assets are only independent of each other in the case of no correlation. Unfortunately, we do not have data on expected correlation in returns between the two assets and thus have to leave a stringent test of the predictions of Beddock and Karehnke, 2021 for future research.

An alternative explanation for the finding that investment in an asset is not affected by the other's assets skewness would be narrow bracketing. If participants view each asset in isolation, then the other asset's moments should not matter. However, the fact that investment in an asset is affected by the expected mean return of the other asset speaks against this explanation.

Another interesting question is whether the correlation between investments and expected skewness is driven by a particular dislike for negative skewness similar to the idea of rare disasters in the macro-finance literature, or a particular preference for positive skewness (e.g., "lottery stocks"). In Table B.41 of the Online Appendix we replicate the static main regression and include separate terms for positive and negative skewness. In both static regressions, all coefficients are as expected; positive skewness is associated with an increase in the portfolio share of an asset, whereas negative skewness is associated with a reduction. With the exception of positive skewness for the AEX, all coefficients are significant at the 10% level or less. The coefficients for positive and negative skewness are not significantly different from each other (Wald tests reported in Section B.6.6). The results thus do not provide strong evidence concerning differential effects of positive and negative skewness.

In March 2014, participants had the chance to update their beliefs and portfolio allocations. As a robustness check, we repeat the cross-sectional analysis presented above after these updates and obtain very similar results (Table B.40 of the Online Appendix). In particular, expected mean and expected skewness for an asset are again positively correlated with that asset's portfolio share.

In sum, cross-sectional variation in expectations and portfolio choices at a fixed point in time are in line with a preference for higher mean returns as well as more positively skewed return distributions. Variation in the standard deviation of respondents' expectations does not, however, seem to be associated with variation in their portfolio shares.

Next, we investigate whether variation in expectations and investments over time allows for the same interpretation. For our dynamic analysis, we rely on the same regression format as before, but we replace the static portfolio decisions and expectations with the respective changes. Thus, we regress changes in portfolio shares between September 2013 and March 2014 on changes in the moments of respondents' expected return distributions between August 2013 and March 2014. We run the regressions both with and without the changes in the respective other asset's expected return distribution and we include the sociodemographic control variables. We report the coefficients of the sociodemographic controls in Table B.19 in Section B.5 of the Internet Appendix. Table 5 shows the results.[14]

Column 1, 2, and 3 contain regressions with the change in the share invested into the AEX as the left-hand variable. The coefficients of $\Delta\mu_{\text{AEX}}$, the change in the mean of the expected return distribution, are positive and significant with p-values of less than 0.05 in all three specifications. Thus, respondents who become more optimistic about the mean of the AEX also increase the share they invest into the AEX in their experimental portfolios. Neither changes in the standard deviation, $\Delta\sigma_{\text{AEX}}$, nor changes in the skewness, $\Delta\gamma_{\text{AEX}}$, of respondents' expected return distributions have a robust effect on respondents' investment decisions. While the coefficient of changes in the standard deviation is significantly negative in columns 1 and 2, it turns nonsignificant once the changes in the moments of the expected return distribution for Philips are added in column 3. In sum, respondents' adjustments of the AEX shares in their portfolios are consistent with a preference for larger mean returns. They do not, however, provide support for the findings concerning skewness from the static regressions, nor do they suggest that respondents prefer lower to higher standard deviations (or the opposite). While the addition of skewness leaves the adjusted R^2 essentially unchanged, the inclusion of the changes in the moments for Philips adds substantially to the model's explanatory power, more than doubling the R^2 from 1.94% to 4.67%.

Columns 4, 5, and 6 of Table 5 contain analogous regressions with the change in the share invested into Philips as the dependent variable. In all three specifications, the coefficient of the change in the mean of the expected return distribution for Philips,

[14]The results reported in this section concerning expected mean and skewness are robust to including the expected return for the savings account (Table B.33) or the portfolio return after 6 months (Table B.34) as a control variable.

$\Delta\mu_{\text{Philips}}$, is significantly positive with p-values of less than 0.10. This indicates that respondents who increase their estimate for the mean return of Philips tend to also increase their investment in Philips. The coefficient of changes in the expected standard deviation, $\Delta\sigma_{\text{Philips}}$, is significant in column 4 but turns nonsignificant once changes in expected skewness are taken into account (columns 5 and 6), suggesting that changes in respondents' beliefs concerning the expected standard deviation do not affect their investment decisions. The coefficient of the change in the expected skewness of Philips returns, $\Delta\gamma_{\text{Philips}}$, is positive and highly significant in columns 5 and 6. The size of

Table 5: Changes in Expectations and Portfolio Dynamics

	Change in Portfolio Share					
	Δ_{AEX}			Δ_{Philips}		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.80***	4.78***	4.29***	−1.38	−1.63	−1.80
	(1.52)	(1.52)	(1.43)	(1.45)	(1.45)	(1.44)
$\Delta\mu_{\text{AEX}}$	0.46**	0.46**	0.59***			0.26*
	(0.23)	(0.23)	(0.24)			(0.16)
$\Delta\sigma_{\text{AEX}}$	−0.47*	−0.48*	−0.18			−0.43
	(0.27)	(0.27)	(0.31)			(0.29)
$\Delta\gamma_{\text{AEX}}$		−0.38	0.06			0.37
		(0.72)	(0.74)			(0.74)
$\Delta\mu_{\text{Philips}}$			−0.38***	0.25*	0.31**	0.26*
			(0.10)	(0.13)	(0.14)	(0.14)
$\Delta\sigma_{\text{Philips}}$			0.03	0.36*	0.25	0.39
			(0.18)	(0.21)	(0.22)	(0.24)
$\Delta\gamma_{\text{Philips}}$			−1.03***		1.06***	0.99***
			(0.37)		(0.36)	(0.36)
Risk aversion	1.22***	1.19***	1.22***	0.06	0.05	0.06
	(0.33)	(0.33)	(0.32)	(0.36)	(0.35)	(0.35)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	1.96	1.94	4.67	3.01	3.95	4.32

Sources: LISS panel and own calculations. The table contains OLS regressions of the change in the share invested into the AEX (columns 1–3) and Philips (columns 4–6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, and financial wealth. The coefficients for these control variables are shown in Section B.5 of the Internet Appendix. Section A.6 of the Appendix defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

the coefficient indicates an economically meaningful effect. An increase in $\Delta\gamma_{\text{Philips}}$ by one standard deviation is associated with an increase of approximately 1.30 percentage points in the share of Philips in the experimental portfolio. For comparison, an increase of $\Delta\mu_{\text{Philips}}$ by one standard deviation is associated with a predicted increase of approximately 1.54 percentage points in the Philips share.

Adding the change in the expected skewness raises the R^2 from 3.01% in column 4 to 3.94% in column 5. Thus, almost one quarter of the temporal variation in investment decisions that the model in column 5 can explain is due to variation in the predicted effect of changes in skewness expectations. Finally, risk aversion is associated with an increased investment in the AEX, but not with changes in the portfolio share of Philips.

Taken together, variation in expectations and portfolio choices at a given point in time as well as changes therein over time show that respondents invest in accordance with a preference for higher mean returns. Neither our static nor our dynamic results, however, suggest that respondents' investments are related to their expectations concerning the standard deviation of the assets' returns, as it would be suggested by canonical theory (e.g., Markowitz, 1952). It is worth noting that the same (null) result with respect to the relevance of expected standard deviations is found in a static setup by Breunig et al. (2021) and Giglio et al. (2021).

Our central results in this section concern the relation between investments and skewness expectations. In 3 of 4 distinct regression settings that include the skewness or changes in the skewness of respondents' return expectations, we find evidence suggesting that respondents prefer skewed return distributions. Only when we regress changes in respondents' AEX investments on changes in the moments of respondents' AEX expectations, we find no result. There are several mutually non-exclusive potential explanations for this result. One explanation is that this reflects the fact that both beliefs and portfolio allocations vary a lot less over time for a given participant than they vary cross-sectionally between participants, as described above. In particular for the AEX, we find a lot less variation in the skewness of participants' expectations over time than there is between participants at a given point in time. As a result, the dynamic regressions likely had less power than the static regressions to pick up the effect of skewness.

A second potential reason could be measurement error. In our context, measurement error in the beliefs would likely have led to attenuation bias in the coefficient estimates and consequently to an underestimation of the coefficient estimates for skewness variables.

Finally, one additional explanation may be that participants faced some kind of adjustment costs. If some participants were unwilling to bear all of these costs a second time and consequently made only partial adjustments or none at all, we would see a lower statistical impact of beliefs during the revision of investment decisions.

5 Robustness

This section provides additional analyses and robustness checks. We focus on the static and dynamic portfolio choice regressions that explore the relation between investment decisions and expectations. The Internet Appendix contains the associated tables, figures, and additional information for each analysis. Throughout, we focus on the effect of (changes in) expected skewness when interpreting the results of the robustness checks.

Alternative estimation of beliefs moments. In our main analyses, we fit cubic Hermite splines to approximate the intervals between points on the stated CDF in order to obtain estimates for a respondent's entire belief distribution. The entire distribution was thus a combination of a set of local estimates. As an alternative and to show the robustness of our results, we fit a skew-normal distribution (Azzalini, 1985) to the entire CDF (B.6.1.2). We also reestimate our main specifications with unimodal histograms only (B.6.1.3). Finally, our main specification sets the outer bounds of the extreme bins to the 5 and 95% quantiles of the respective asset's historical return distribution. To allow for the possibility that respondents had more extreme returns in mind when putting balls into these bins, B.6.1.1 of the Internet Appendix analyzes the case when we set the bounds to more extreme percentiles (2.50 and 97.50%). The results of all three alternative estimations qualitatively confirm the main findings.

Additional controls. In this section of the Internet Appendix we confirm that our results are robust to including additional control variables. These include questions on how hard, interesting, and clear participants found our experiments (B.6.2.1), week fixed effects to account for the fact that the experiment was conducted over the course of several weeks (B.6.2.2), and data on financial numeracy, sources of financial advice, and stock market participation (B.2.1).

Alternative specifications. As we mention in Section 4, we chose our main specification for the sake of parsimony. To show the robustness of our results, Section B.6.3 presents three alternative specifications. The first specification shows that our results hold up if we drop all controls but the belief variables, though it is worth pointing out that dropping the controls substantially reduces the explanatory power of the regressions. The second specification shows that we obtain the same result if we run a Tobit regression instead of OLS to account for the fact that our outcome variables are bounded. The third specification shows that the results are robust to including the variance of beliefs instead of the standard deviation. Table B.37 presents alternative specifications of the dependent variables. Column 1 shows that expected mean and skewness of both assets also predict the overall share invested in risky asset. Columns 2 and 4 show that the difference between the expected means and the difference between the expected skewness for the two assets predicts the absolute difference between the holdings of the two risky assets, and their relative share in the risky part of the portfolio. Columns 4 and 5 show that this also holds for the dynamic regressions.

Stock market experience. Our final robustness check concerns the question whether the results of our main analyses differ between participants who were holding stocks or funds at the time of the experiment and those who did not by interacting a stockholding dummy with our belief variables (B.6.4). Overall, these analyses do not suggest that the relation of portfolio choice and skewness expectations differs by much between participants who invest or do not invest in the stock market.

6 Conclusion

Although many theories of investor behavior posit or imply that individual investors have a preference for skewness, directly testing this prediction outside the laboratory has proven to be difficult. The key challenge lies in a lack of detailed data on the skewness of investors' return expectations. We address this challenge by directly measuring return expectations in a representative sample of the Dutch population. We first document that individuals entertain highly heterogeneous expectations. We then relate this heterogeneity in expected skewness to investment decisions in complementary incentivized portfolio choice experiments. Consistent with theoretical predictions, we find that individuals' investments in the experimental assets increase with the expected skewness of the respective asset's return distribution. Using data from a second set of experiments at a later point in time, we show that changes in expected skewness lead to higher investments in the asset with more temporal variation in skewness expectations. Overall, both in the cross-section and over time, individual investors' behavior is consistent with a preference for skewness.

Our results fill a gap between lab and observational evidence for skewness preferences. While lab settings control the skewness of the payoff distribution and have little to say about individuals' expectations, existing observational evidence relies on strong assumptions concerning the expectation formation process. We relax these assumptions and link observed portfolio choices to direct measurements of individuals' subjective expectations. Our findings caution that it may be challenging to find suitable empirical proxies for the skewness of individuals' expectations. While we find some consistency in individuals' skewness expectations for different assets, we also show that variation between individuals may be empirically hard to model, even when using rich sociodemographic background characteristics. But there is also good news. A large part of the observational literature documents a pricing premium for stocks with higher skewness and hypothesizes that the premium is driven by investors' preference for skewness. Our result that investors favor stocks with positively skewed expected payoff distributions provides evidence for this hypothesis.

The literature on subjective stock market expectations has overwhelmingly stayed within the confines of canonical theory, typically operationalizing beliefs as the mean and standard deviation of expected return distributions. Our results suggest that broadening the perspective to include skewness could be a fruitful direction for future research. More generally, our findings call for more research on decision processes that go beyond the mean-variance model (e.g., Ameriks and Zeldes, 2004; Binswanger and Salm, 2017; Drerup et al., 2017).

Methodologically, our findings point to the added value of survey devices which are capable of detailed characterizations of individuals' expectations like the graphical interface proposed in Delavande and Rohwedder (2008). Exercises similar to the one conducted in this paper readily extend to other contexts where individuals have to form expectations over potentially highly skewed outcomes. For example, measuring expected skewness could contribute to a better understanding of insurance choice or certain types of gambling such as sports betting.

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A Appendix

This appendix contains extended descriptions of the data and methods used in “Skewness Expectations and Portfolio Choice”. The experimental instructions can be found in their original form on the website of the LISS panel (https://www.dataarchive.lissdata.nl/study_units/view/576/).

A.1 Extended asset descriptions

Each experimental task was accompanied by descriptions of the assets, including details of how the payoff-relevant values of each asset at the end of the experiment would be calculated. The following descriptions are translated from Dutch. For the AEX exchange traded fund, the description read as follows:

> iShares AEX UCITS ETF with ISIN IE00B0M62Y33. This is an Exchange Traded Fund (ETF) that aims to track the performance of the AEX as accurately as possible. The ETF invests in the (physical) securities the index consists of. The AEX index offers exposure to the 25 most traded shares listed on NYSE Euronext Amsterdam. The index is a weighted index based on free-float adjusted market capitalization. The total expense ratio is 0.3%. More information can be found on this website.

To ensure respondents understood the notion of a total expense ratio, a formula was provided for the index fund's value in a year:

> value in a year $=$ €100 $-$ €0.30 (fees) $+$ change in AEX index.

Respondents were told that the value of Philips in a year would be calculated as:

> value in a year $=$ €100 $+$ (dividend paid) $+$ change in Philips share price (pos. or neg.)

and they were informed that the relevant stock would be

> (...) Royal Philips NV, ISIN NL0000009538, traded on the Amsterdam stock exchange (...)

Respondents were told that the value of money in the savings account would be calculated as:

> value in a year $=$ €100 $+$ (potential interest revenue).

In addition, they were told:

> **Details**: To be precise, this is about an ordinary bank account of which money can be withdrawn at any time. Such accounts are covered by a deposit guarantee of up to 100,000 euros from the Dutch state.

For the calculation of eventual payouts and portfolio returns, the rate of return provided by Rabobank, one of the biggest banks of the Netherlands, for their product "Rabo Spaar-Rekening" was employed.

A.2 Expectations interface

In August 2013, respondents were asked to describe their expectations for the development of an AEX index fund and shares of Philips. Figure A.1 shows all steps of the iterative procedure used to elicit the distribution of expectations for each asset. To familiarize respondents with the interface, an introductory video was shown before they were asked for their expectations.

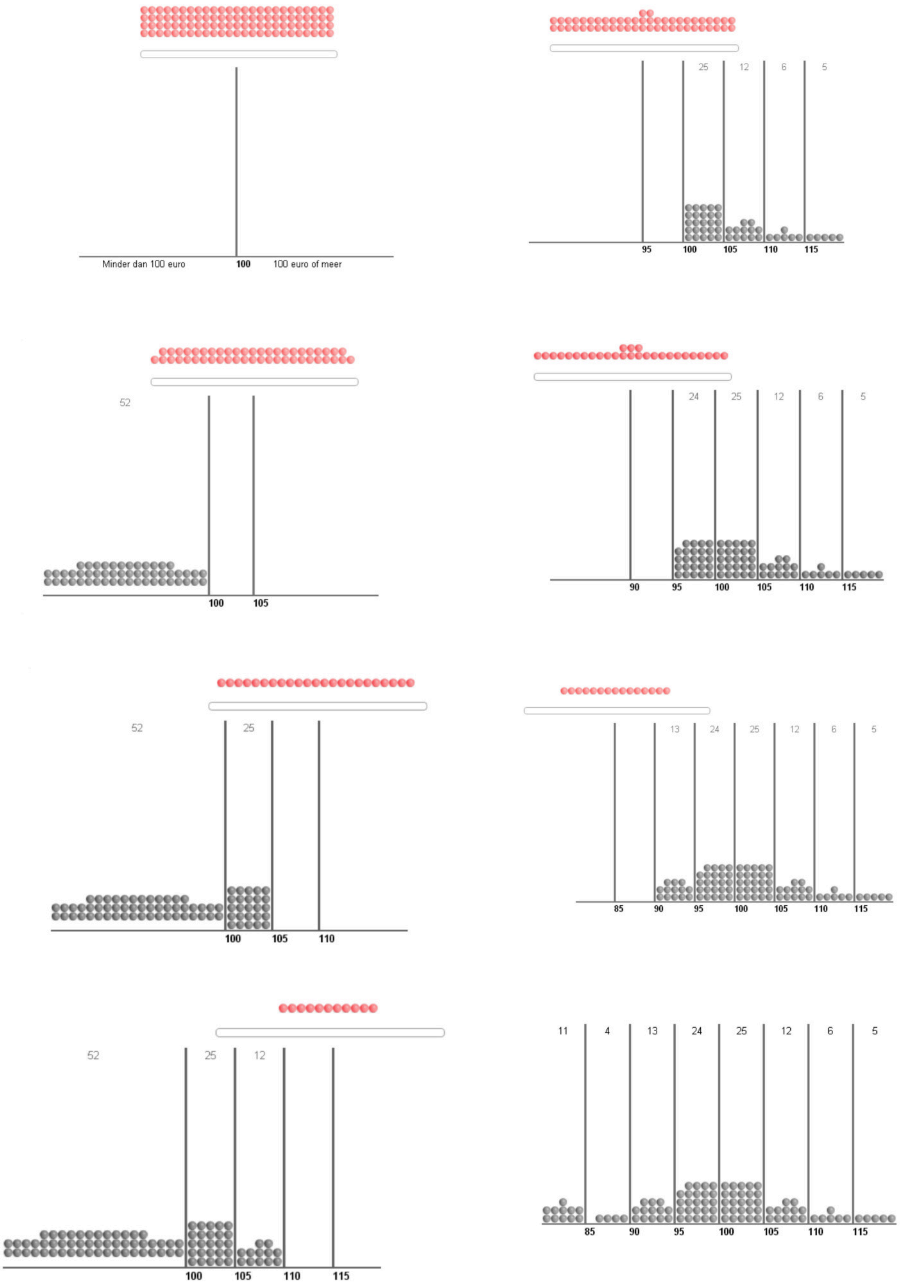


Figure A.1: Iterative expectations interface August 2013

Source: LISS Panel. The figure shows step 1 to 8 (1 to 4 in the left column, 5 to 8 in the right column) of the iterative procedure used to elicit expectations in August 2013. Respondents could use the slider at the top of the screen to distribute balls from left to right. The red balls above show the remaining balls. The 6 interior bins covered intervals of €5 each. The outer bins were open. The light gray numbers at the top show the number of balls within each bin.

In March 2014, respondents were asked whether they would like to adjust their expectations for both assets. To this end, they were first informed about the current value of the asset under consideration. Afterwards, a slightly adapted version of the expectations interface used in August 2013 was presented. Two aspects were changed: For one, instead of having to start entirely anew, the interface was now preset to the distribution of beliefs elicited in August 2013. Second, respondents could use + and − signs below each bin to increase or decrease the number of balls within. Figure A.2 shows the interface in March 2014.

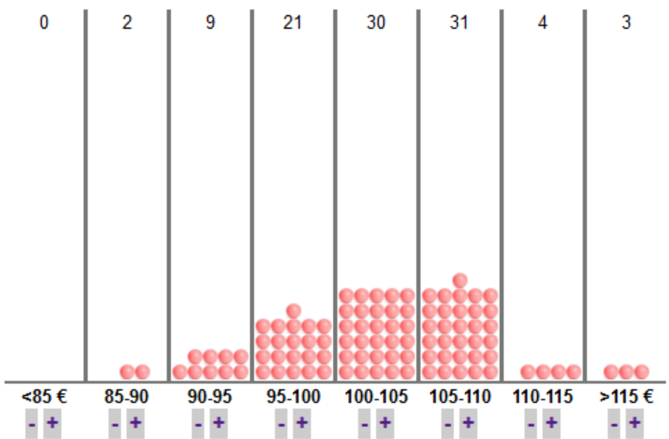


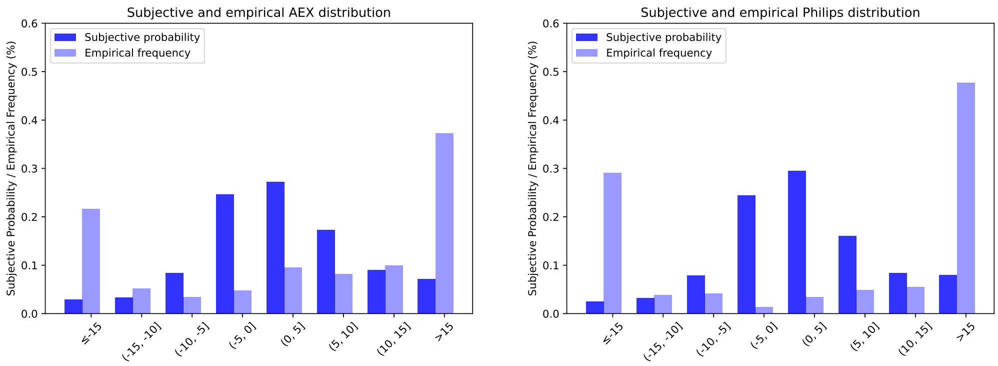
Figure A.2: Expectations interface March 2014

Source: LISS Panel. The figure shows the interface that allowed respondents to adjust their expectations in March 2014. The 6 interior bins covered intervals of €5 each. The outer bins were open. The + and − signs below each bin could be used to adjust the number of balls within the bin. The numbers at the top show the number of balls within each bin.

A.3 Distribution of balls

Figure A.3 plots the historical distribution of (inflation-adjusted) AEX returns (left panel) and Philips (right panel) alongside the average probabilities expected by our sample respondents. For both assets, respondents consider returns at both ends of the provided spectrum, i.e., in excess of $+15\%$ as well as below -15%, to be less likely than what has historically been observed. Figure A.4 replicates the figure for the second belief elicitation in March 2014. Subjects shifted on average some probability mass to the bins indicating more positive returns.

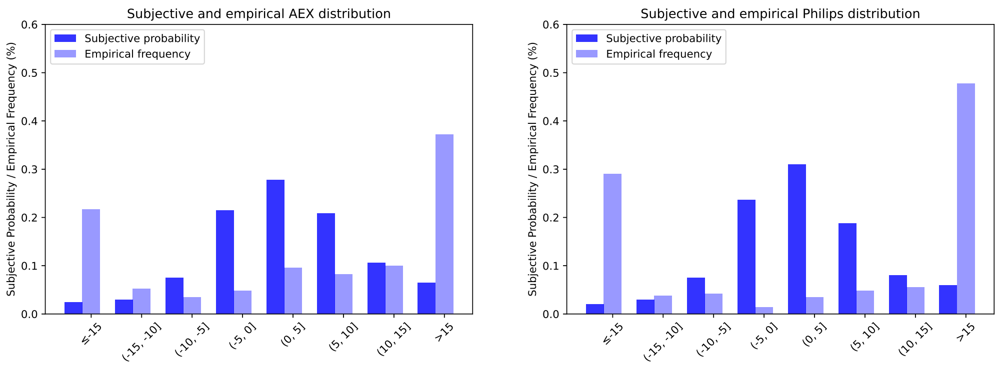
Figure A.3: Expected and historical distribution of AEX and Philips



(a) AEX (b) Philips

Sources: LISS panel and own calculations.

Figure A.4: Expected and historical distribution of AEX and Philips – second elicitation



(a) AEX (b) Philips

Sources: LISS panel and own calculations.

A.4 Point estimates for the return of the savings account

In September 2013, point estimates for the return of the savings account were elicited using the following task (translated from Dutch):

> Now consider a savings account with a Dutch bank. Suppose you put 100 euros into such an account (details). In about one year, you will have the following sum of money:
>
> $$\text{value in a year} = €100 + (\text{potential interest revenue}).$$
>
> How much do you expect the amount of 100 in a standard bank account to be worth in a year? Enter the amount in euros.

When clicking on details, respondents were presented with the description provided for the savings account shown in Section A.1 of this appendix. For all of our analyses we winsorize the point estimates at their 5% and 95% quantiles.

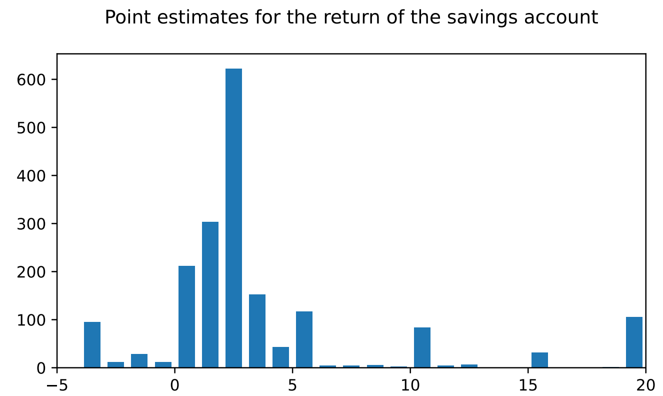


Figure A.5: Distribution of point estimates for the return of the savings account

Source: LISS Panel. The figure shows the distribution of point estimates for the return of the savings account.

A.5 Portfolio choice experiment

A.5.1 Portfolio interface

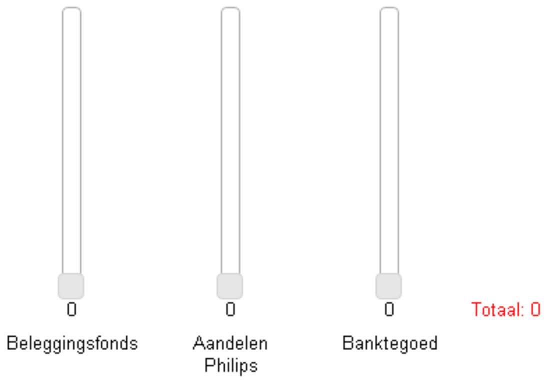


Figure A.6: Portfolio interface September 2013

Source: LISS Panel. The figure shows the graphical interface of the investment experiment in September 2013. Respondents could move the sliders up and down to allocate a total of €100 among an AEX index fund (“Beleggingsfonds”), shares of Philips (“Aandelen Philips”), and a savings account (“Banktegoed”). “Totaal” indicates the aggregate value of the current portfolio composition.

Figure A.6 shows the interface of the portfolio choice experiment in September 2013. The three columns in the figure show the €-shares (in integers) allocated to individual portfolio positions. Respondents could shift the grey controls in each column up and down to increase or reduce the share invested into a given position. “Beleggingsfonds” is the AEX index fund, “Aandelen Philips” is Philips, and “Banktegoed” is the savings account. To the right of the screen respondents saw how much money was currently allocated across the portfolio in total (“Totaal”). They could only proceed with the survey once this value was exactly equal to 100.

In March 2014, respondents were asked to revisit their portfolio decisions. Again, a graphical interface was employed (Figure A.7). This time, however, respondents did not start out with an empty portfolio as in September 2013. Instead, the interface was preset to the value of the initially selected portfolio, adjusted for intermittent returns between September 2013 and March 2014. Thus, the composition presented was different from the one respondents had originally chosen. Figure A.7, for example, contains a portfolio that has appreciated in value and is now worth a total of €106. Respondents were asked to move the sliders to change their portfolios' compositions. They could proceed with the survey only in case the full current value of the portfolio had been distributed.

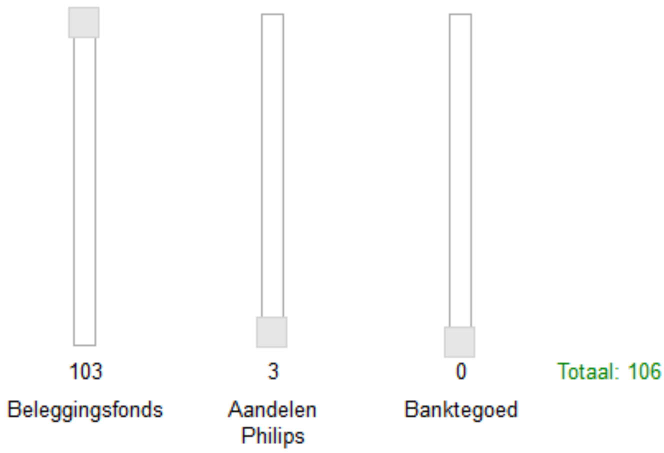


Figure A.7: Portfolio interface March 2014

Source: LISS Panel. The figure shows the graphical interface of the investment experiment in March 2014. The sliders were initially set to the composition of a respondent's portfolio after the value of individual assets as well as the portfolio's total value were adjusted for returns between September 2013 and March 2014. Respondents could move the sliders up and down to reallocate the new total portfolio value among the AEX index fund ("Beleggingsfonds"), shares of Philips N.V. ("Aandelen Philips"), and the savings account ("Banktegoed"). The depicted example shows a portfolio that has increased in value from €100 to €106.

A.5.2 Portfolio share descriptives

Table A.1 presents descriptive statistics for individual portfolio shares in August 2013 and March 2014 (after rebalancing).

The left panel of Figure A.8 shows the distribution of respondents' portfolio compositions in September 2013. Each point in the simplex is a bivariate kernel density estimate for varying portfolio shares invested into the AEX (x-axis) and Philips (y-axis) in September 2013. In the right panel, we show similarly constructed kernel density estimates for the changes in portfolio compositions between September 2013 and March 2014, conditional on respondents actively changing at least one component of their portfolios.

Table A.1: Portfolio descriptives

	Mean	S.d.	Min	P10	P30	P50	P70	P90	Max.
$AEX_{\text{Aug 2013}}$	0.350	0.268	0.00	0.000	0.200	0.310	0.500	0.714	1.00
$Philips_{\text{Aug 2013}}$	0.330	0.243	0.00	0.000	0.200	0.300	0.420	0.650	1.00
$AEX_{\text{Mar 2014}}$	0.380	0.263	0.00	0.000	0.228	0.360	0.505	0.738	1.00
$Philips_{\text{Mar 2014}}$	0.324	0.225	0.00	0.000	0.202	0.301	0.404	0.594	1.00
Change AEX	0.030	0.138	-1.00	-0.051	0.000	0.007	0.012	0.160	1.00
Change Philips	-0.006	0.135	-1.00	-0.110	-0.007	0.000	0.002	0.097	1.00
Abs. change AEX	0.068	0.124	0.00	0.000	0.006	0.010	0.062	0.196	1.00
Abs. change Philips	0.063	0.119	0.00	0.000	0.002	0.008	0.057	0.188	1.00
Performance AEX after 6 months	0.050	0.018	0.02	0.020	0.050	0.060	0.060	0.070	0.07
Performance Philips after 6 months	0.017	0.028	-0.02	-0.020	0.000	0.040	0.040	0.050	0.05
Performance Portfolio after 6 months	0.024	0.021	-0.02	0.000	0.010	0.020	0.040	0.050	0.07

Sources: LISS panel and own calculations. The table shows descriptives for individual portfolio shares in August 2013 and March 2014 and descriptives of the performance of the AEX, Philips, and the total portfolios after 6 months.

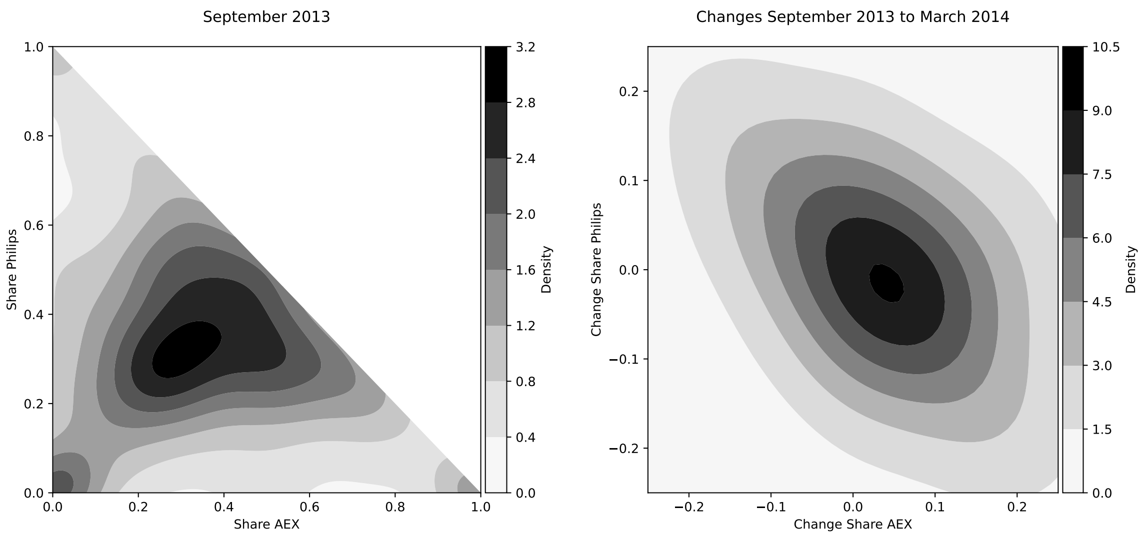


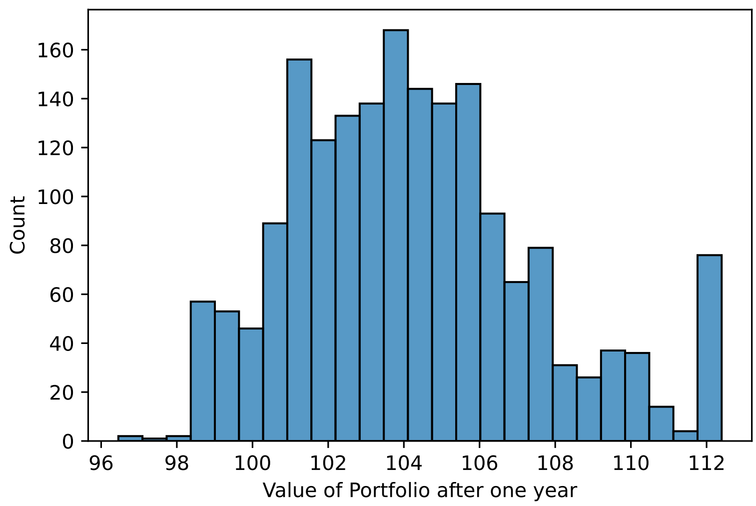
Figure A.8: Distribution of portfolio compositions

Source: LISS Panel and own calculations. The figure shows estimates of the distribution of respondents' portfolio compositions in September 2013 (left panel) and of the distribution of changes in these compositions in March 2014 (right panel). Each point in the plot corresponds to a bivariate kernel density estimate for given shares invested into the AEX index fund (x-axis) and Philips (y-axis). The distance between each point in the left panel and the hypotenuse corresponds to the share in the savings account. In the right panel, the change in the share of the savings account corresponds to the negative sum of the changes in AEX and Philips. Darker areas contain higher density in both panels.

A.5.3 Portfolio value after one year

Figure A.9 shows the distribution of portfolio values after one year.

Figure A.9: Distribution of portfolio value after one year



Sources: LISS panel and own calculations.

A.6 Sociodemographics

We construct a range of sociodemographic control variables. Part of the experimental instructions was that the financial decision maker of the household should fill in the questionnaire.

Education. LISS collects information on respondents' educational attainment. We create an indicator, "High education", that is 1 for respondents who report either a university degree or higher vocational education, and 0 otherwise.

Age. We use LISS's data on birthyears to create a set of indicator variables for age groups (31 to 50, 51 to 65, and for respondents older than 65).

Gender. We create a binary variable for gender, "Female", that is 1 in case the respondent is female.

Marital status. Using LISS's data on the current marital status, we create a variable, "Married", equaling 1 in case the respondent reports currently being married, and 0 otherwise.

Having children. LISS collects data on the number of children. "Has children" is 1 for all respondents reporting more than 0 children.

Financial wealth. LISS collects detailed information on respondents' financial assets. We use this data to obtain an estimate for the value of a respondent's portfolio. To this end, we sum the amounts the respondent reports holding as investments and those in the bank. We set negative amounts of the latter to 0.

For each category of asset, respondents are allowed to provide either continuous or interval statements. Calculating continuous portfolio values requires dealing with the categorical answers. We do this by replacing each interval with its midpoint. For example, if a respondent reports "€7,500 to €10,000" in some category, we replace this answer by the interval's midpoint, €8,750. We always use the most detailed level of available information. In case a respondent reports values for the aggregate investment category as well as for its subcategories (stocks, funds, and other investments), we use the more detailed data. In case detailed data is not available, we use the answer to the aggregate question.

Based on the resulting estimate, we create indicators for "Financial wealth $\in$ (€10,000, €30,000)" and "Financial wealth $\in$ (€30,000, ∞)". For respondents preferring not to answer the relevant questions we create one more binary variable, "Financial wealth missing".

Net household income. Using LISS's information, we categorize households by their net income. For those with income in excess of €2,500, which is the median income of households providing an answer to the income question, we create the variable "Net income > €2,500". We also create an indicator for households with missing values for income ($\approx$ 7% of the sample), "Net income missing".

A.7 Risk aversion

In September 2013, respondents' aversion to risk was measured. The variable we used in our analyses was composed of three different measures, two based on respondents' self-assessments and one quantitative measure. For our analyses, we standardize each of the measures and take their average as our proxy for a respondent's aversion to risk.

Risk questions. The risk questions relied on variants of those developed for the "Preference Survey Module" of Falk et al. (2016). These questions were explicitly designed to measure economic preference parameters in large-scale surveys like ours. To validate them, Dohmen et al. (2011) show that they are predictive of behavior in experiments as well as in risky situations in the field, including the decision to participate in the stock market. Respondents were asked both for their willingness to take risks in general as well as in financial matters:

> *"Different people have different opinions and characteristics. We are interested in how you describe yourself. In general, to what extent are you willing to take risks? You can answer this question by clicking somewhere on the slider (0-10)."*

"And, in general, to what extent are you willing to take risks in financial matters? You can answer this question by clicking somewhere on the slider (0-10)."

Figure A.11 shows that respondents in the sample are very heterogeneous with respect to their risk preferences.

Risk lottery. In addition to the qualitative measures, a quantitative measure of risk aversion was constructed. To derive this measure, respondents were asked a series of interdependent hypothetical binary lottery choices. In each of five consecutive rounds, this so called "staircase procedure" asked respondents to decide between a safe payment and a lottery. The lottery was fixed throughout the rounds, every time offering a 50/50 chance to win €300 or nothing. The safe payment, however, varied. Depending on whether the respondent decided to accept the lottery in the previous round or not, the safe payment offered in the next question would either increase (upon acceptance of the lottery) or decrease (upon its rejection).

For instance, the first round started with a safe payment of €160. If the respondent chose the lottery, the safe payment was increased to €240 in the next round. If the safe payment was chosen, the safe amount was consecutively reduced to €80. Ultimately, each respondent arrived at one of 32 possible outcomes, which were evenly spaced between 0 and €320. In essence, the procedure allows us to zoom in on a respondent's certainty equivalent. To facilitate comprehension of the lottery, each round was accompanied by a graphical representation of the choice (see Figure A.10).

Figure A.11 shows that most subjects end up with estimated certainty equivalents below €160, indicating risk averse behavior.

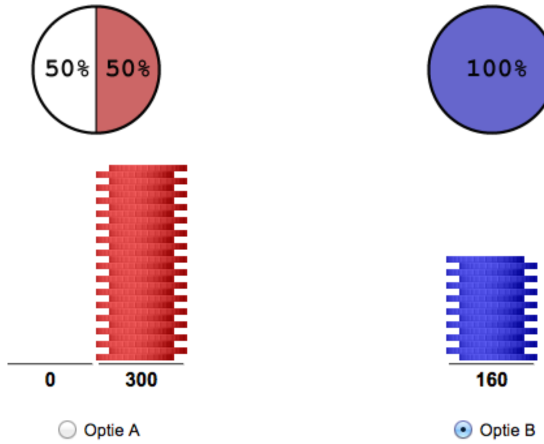


Figure A.10: Graphical illustration of hypothetical lottery choice

Sources: LISS panel and own calculations. The figure shows the visual interface accompanying one of the lottery decisions.

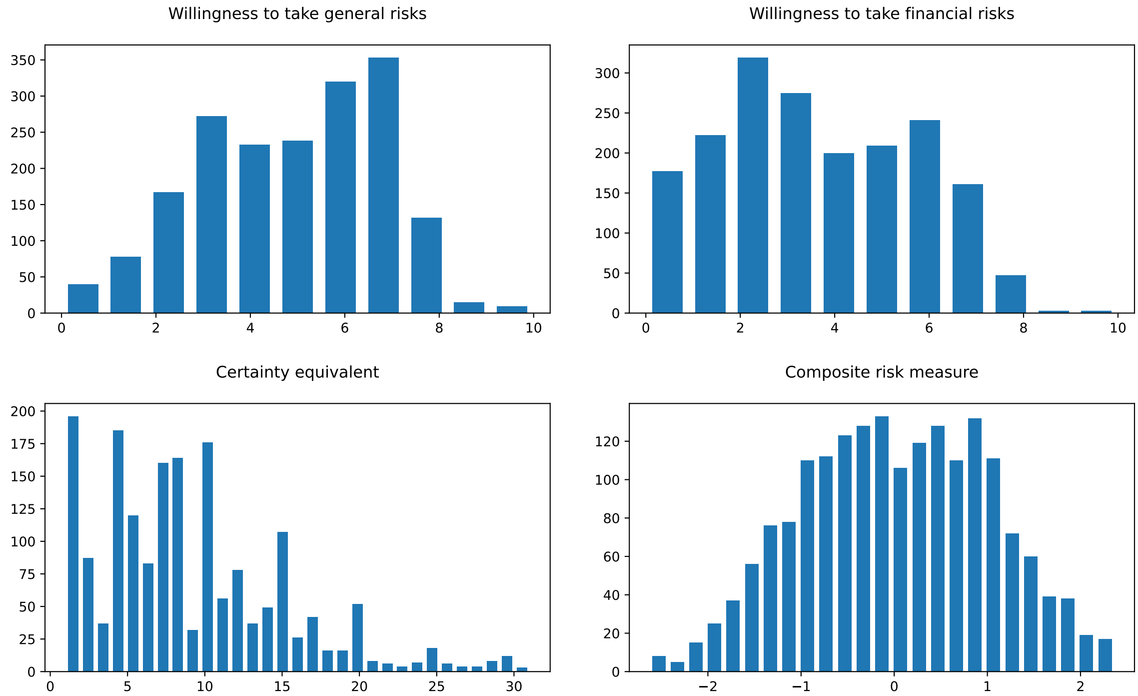


Figure A.11: Distribution of risk aversion components and aggregate variable

Sources: LISS panel and own calculations. The figure shows the distribution of individual components of our composite risk aversion measure as well as the distribution of the measure itself.

B Internet Appendix

This appendix contains extended descriptions of the data and methods used in "Skewness Expectations and Portfolio Choice". The experimental instructions can be found in their original form on the website of the LISS panel (https://www.dataarchive.lissdata.nl/study_units/view/576/).

B.1 Response and completion rates

Table B.1 shows the number of invitees and respondents for all parts of the experiment. Our main sample includes 1,857 respondents who completed the wave in March 2014.

Table B.1: Response and completion rates

Wave	Sample	Invited	Responded	Completed
Aug 2013	Wealth $\geq 1,000$ or unknown	2,978	2,377 (79.8%)	2,311 (77.6%)
Sep 2013	Participants of wave 1	2,307	2,130 (92.3%)	2,125 (92.1%)
Mar 2014	Participants of wave 2	2,095	1,865 (89.0%)	1,857 (88.6%)
Oct / Nov 2014	Participants of wave 1	2,255	1,966 (87.2%)	1,965 (87.1%)

B.2 Description of financial numeracy and financial advice

B.2.1 Financial numeracy

In October 2014, respondents were asked three questions due to van Rooij et al. (2011) to determine their familiarity with concepts related to basic financial numeracy:

> **Question 1 - Simplest numeracy:** Suppose you have 100 euros on a savings account with an annual interest rate of 2 per cent. How much will you have on the savings account after five years, assuming you leave the money in this account?

- More than 102 Euros
- Less than 102 Euros
- Exactly 102 Euros
- Do not know

Question 2 - Interest compounding: Suppose you have 100 euros on a savings account with an annual interest rate of 20 per cent and you never withdraw any money or interest. How much will you have after five years in total?

- More than 200 Euros
- Less than 200 Euros
- Exactly 200 Euros
- Do not know

Question 3 - Inflation: Suppose the interest rate on your savings account is 1 per cent per year and inflation is 2 per cent per year. After one year, how much will you be able to buy with the money in the account?

- Less than today
- More than today
- Exactly the same as today
- Do not know

Altogether, 1674 of the subjects of our main sample participated in that questionnaire. We count the number of correct answers and standard normalize the measure.

B.2.2 Financial advice

In October 2014, respondents were also asked for their main source of financial advice. Altogether, 1674 of the subjects of our main sample participated in that questionnaire.

Participants were given nine options which we aggregate to the following five categories:

- internet (22% of the sample): 'Financial Information on the Internet'
- newspaper/books (13% of the sample): 'Newspaper articles', 'Financial magazines, guides, books'
- parents/friends (26% of the sample): 'Parents, friends or acquaintances'
- professional (24% of the sample): 'Professional advisors in financial matters', 'Folders from my bank or mortgage advisor'
- other (17% of the sample): 'Advertising on TV, in newspapers or other media', 'Financial computer programs', 'other'

In the regressions, we use professional advice as the left-out category.

B.3 Expectations

B.3.1 Hermite splines

The method we employ to estimate the moments of an indiviual's belief distribution is similar to the method proposed in Bellemare et al. (2012). Based on the number of balls assigned to each bin, we first calculate a discrete cumulative distribution function. To do this, we use the fraction of balls assigned to bins falling below each inter-bin boundary as an estimate of the CDF at this point. Since the outer bins were open, we set them to the value a €100 investment would have had at the 5th and 95th percentile of the historical return distribution of the respective asset over a calendar year, i.e., to €56.35 and €142.98 for the AEX and to €53.23 and €196.88 for Philips. Section B.4 shows further details on the historical distributions.

Next, we connect the 9 points on the resulting CDF using a monotonically increasing cubic spline. When fitting the splines, we require that the first derivative at each of the 7 interior points coincides with the respective first derivative of the polynomial in the next-higher interval. The resulting estimate of an individual's belief distribution allows us to calculate the mean, standard deviation, and skewness of the individual's estimates. We use the SciPy functions `scipy.interpolate.PchipInterpolator` to fit the splines and we use `scipy.integrate.quad` to integrate over their support when estimating the moments. Figure B.1 shows a number of CDFs interpolated in this way alongside the underlying distribution of balls and the associated density estimates.

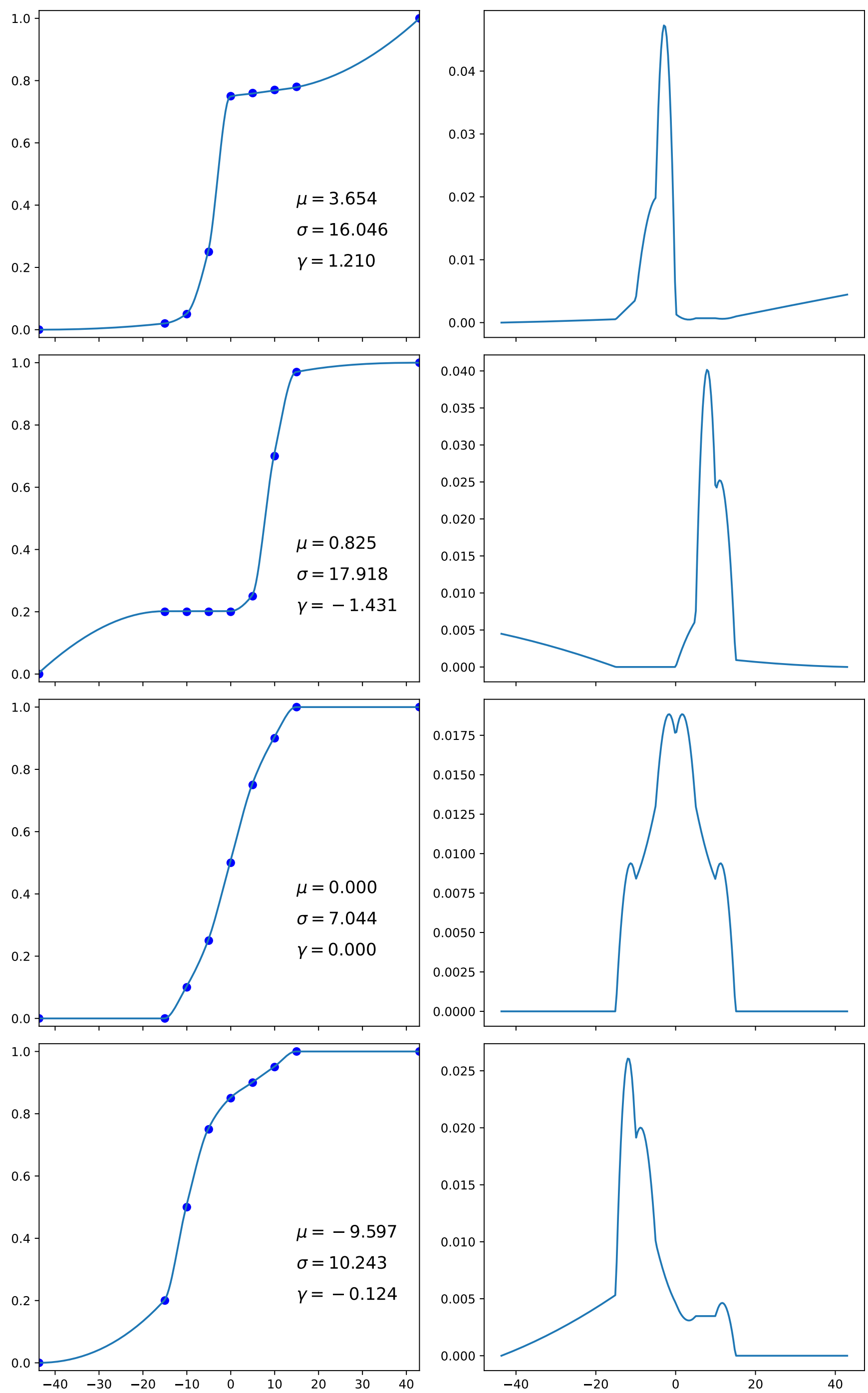


Figure B.1: Example splines

Source: Own calculations. The figure shows estimated splines for 4 hypothetical distributions of balls. The left column shows the estimated splines alongside the distribution of balls (blue dots). The right column shows the associated density estimates.

B.3.2 Additional descriptives for beliefs

Figure B.2, Figure B.3, and Figure B.4 present histograms for the distribution of the means, standard deviations, and skewness of the expected return distributions for the AEX and Philips.

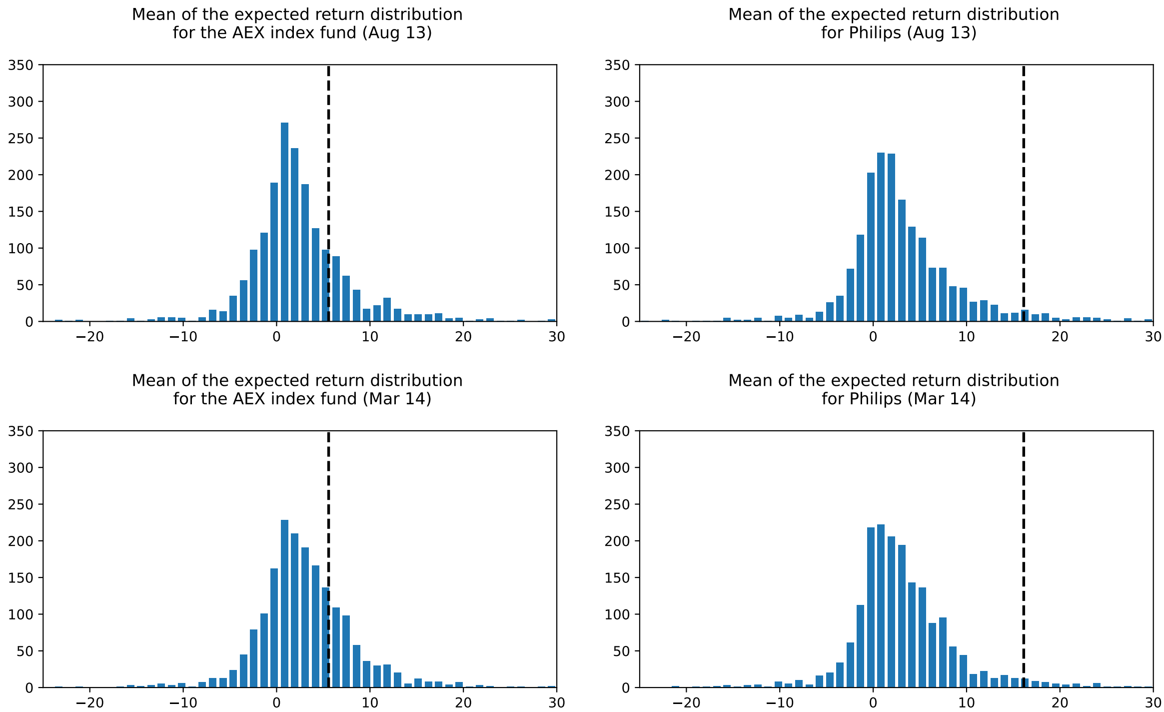


Figure B.2: Cross-sectional distributions of mean return expectations

Sources: LISS panel / yahoo! finance / Statistics Netherlands / own calculations. Distribution of the mean of the expected return distributions for an investment in the AEX (left) and Philips (right) between August 2013 and August 2014 (top) or between March 2014 and August 2014 (bottom).

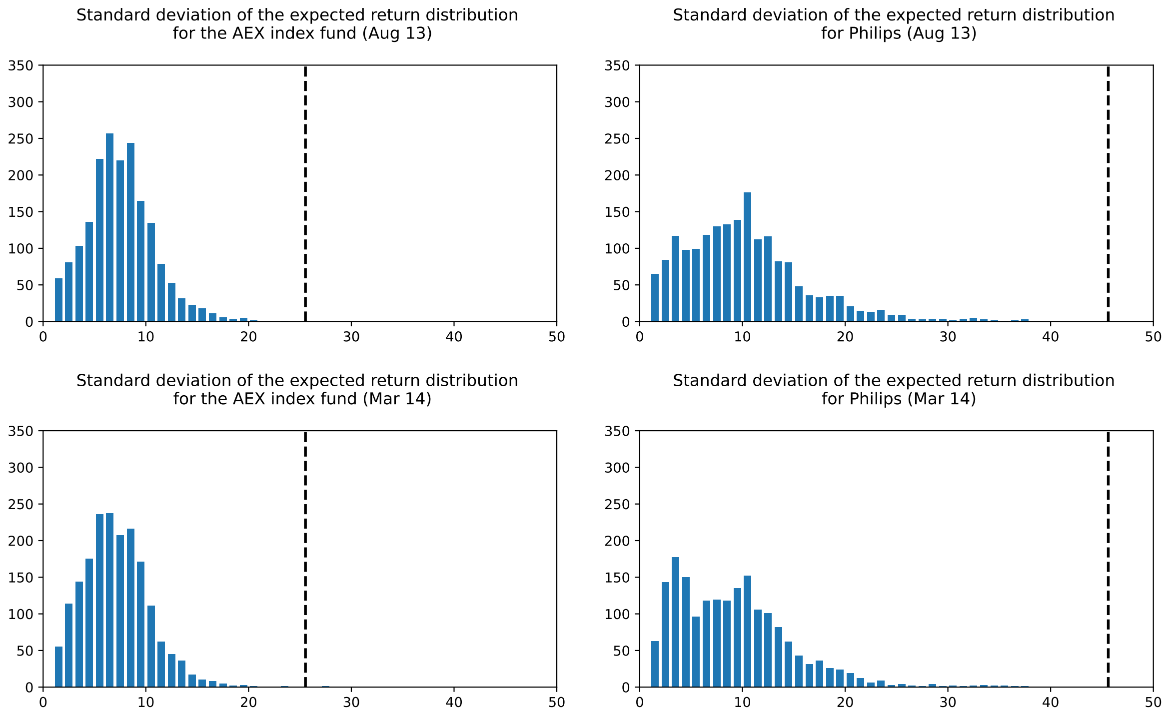


Figure B.3: Cross-sectional distributions of the standard deviation of expected returns

Sources: LISS panel / yahoo! finance / Statistics Netherlands / own calculations. Distribution of the standard deviation of the expected return distributions for an investment in the AEX (left) and Philips (right) between August 2013 and August 2014 (top) or between March 2014 and August 2014 (bottom).

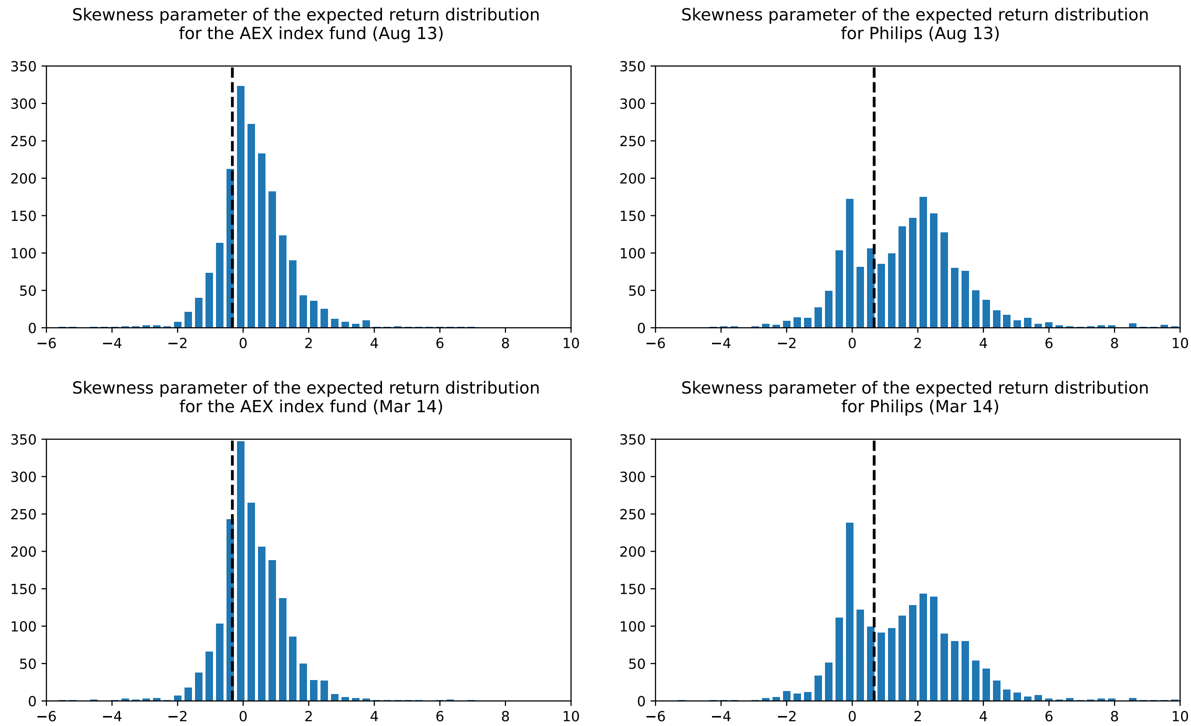


Figure B.4: Cross-sectional distributions of the skewness of expected returns

Sources: LISS panel / yahoo! finance / Statistics Netherlands / own calculations. Distribution of the skewness of the expected return distributions for an investment in the AEX (left) and Philips (right) between August 2013 and August 2014 (top) or between March 2014 and August 2014 (bottom). The top two panels are the same as in the main text.

B.3.3 Additional descriptives for changes in beliefs

Table B.2: Distribution of the changes of the estimated moments of the expected return distributions

	Mean	S.d.	Min.	P10	P30	P50	P70	P90	Max.
$\Delta\mu_{\text{AEX}}$	0.63	3.07	−36.95	−0.35	0.00	0.00	0.39	3.10	29.43
$\Delta\sigma_{\text{AEX}}$	−0.43	1.60	−16.41	−2.02	−0.10	0.00	0.00	0.26	7.11
$\Delta\gamma_{\text{AEX}}$	−0.03	0.68	−6.07	−0.44	0.00	0.00	0.00	0.43	5.54
$\Delta\mu_{\text{Philips}}$	−0.71	5.92	−61.82	−2.25	0.00	0.00	0.00	1.54	24.88
$\Delta\sigma_{\text{Philips}}$	−1.14	3.47	−33.21	−4.44	−0.22	0.00	0.00	0.11	15.81
$\Delta\gamma_{\text{Philips}}$	−0.16	1.31	−9.02	−1.13	0.00	0.00	0.00	0.60	9.78

Table B.3: Share of subjects that increased, decreased, or did not change belief parameters between the two elicitations

	increased	decreased	no change
return aex	0.38	0.14	0.48
std aex	0.17	0.35	0.48
skew aex	0.24	0.28	0.48
return philips	0.27	0.24	0.49
std philips	0.14	0.37	0.49
skew philips	0.26	0.25	0.49

Table B.4: AEX: any changes in beliefs and/or portfolio

	No (active) change in Portfolio	Any (active) change in Portfolio	Total
No change in Beliefs	0.38	0.10	0.48
Any change in Beliefs	0.20	0.32	0.52
Total	0.59	0.41	1.00

Table B.5: Philips: any changes in beliefs and/or portfolio

	No (active) change in Portfolio	Any (active) change in Portfolio	Total
No change in Beliefs	0.39	0.10	0.49
Change in Beliefs	0.19	0.31	0.51
Total	0.59	0.41	1.00

B.3.4 Determinants of belief moments

Table B.6 and Table B.7 show pairwise Pearson correlations between the distinct belief measures and sociodemographics in August 2013 and March 2014. Correlations printed in bold are significantly different from zero at the 1 percent level.

Table B.8 and Table B.9 show regressions of the expected means and standard deviations of expectations in August 2013 on sociodemographic covariates. Section A.6 provides definitions for the covariates.

In Tables B.10, B.11, and B.12 four additional variables are used as independent variables: risk aversion, financial literacy, financial advice and a dummy variable indicating if the subject invests in any stocks or funds. Section B.2 provides definitions for financial numeracy and financial advice. Due to non-response by a small number of respondents in the respective questionnaire and item non-response to the questions about stock market participation, the regressions are based on $1,318$ observations.

Table B.6: Pairwise correlations between belief measures and sociodemographics — August 2013

	μ_{AEX}	σ_{AEX}	γ_{AEX}	μ_{Philips}	σ_{Philips}	γ_{Philips}	Exp. return for savings account	Female	Net income > €2500	Net income missing	Financial wealth ∈ (€10000, €30000]	Financial wealth ∈ (€30000, ∞)	Financial wealth missing	High education	30 < Age ≤ 50	50 < Age ≤ 65	Age > 65	Married	Has children	Risk aversion
μ_{AEX}	1	-0.00	**0.09**	**0.41**	**0.14**	0.00	-0.05	**-0.15**	**0.12**	-0.03	-0.00	**0.14**	**-0.12**	**0.09**	0.04	0.05	**-0.08**	0.02	0.04	**-0.16**
σ_{AEX}	·	1	**-0.14**	**0.07**	**0.47**	0.03	**0.12**	**0.06**	-0.05	0.00	-0.02	**-0.10**	0.06	**-0.07**	0.04	**-0.07**	0.02	-0.03	-0.02	-0.01
γ_{AEX}	·	·	1	**0.07**	0.00	**0.14**	-0.01	-0.03	-0.01	-0.01	-0.01	0.03	-0.02	-0.03	-0.06	0.01	0.05	0.00	0.01	0.03
μ_{Philips}	·	·	·	1	**0.56**	-0.05	0.06	**-0.07**	0.05	-0.05	-0.01	0.05	-0.06	0.01	-0.01	0.00	-0.00	0.01	0.01	-0.04
σ_{Philips}	·	·	·	·	1	**0.08**	**0.12**	0.02	0.00	-0.02	-0.03	-0.03	0.01	**-0.06**	-0.01	-0.04	0.01	-0.02	-0.03	-0.02
γ_{Philips}	·	·	·	·	·	1	0.00	0.02	0.00	-0.02	0.00	0.00	-0.02	-0.01	**-0.06**	0.01	**0.07**	0.00	-0.02	0.00
Exp. return for savings account	·	·	·	·	·	·	1	**0.17**	**-0.08**	-0.02	0.00	**-0.15**	**0.07**	**-0.13**	**0.09**	**-0.10**	-0.02	**-0.08**	0.01	0.02
Female	·	·	·	·	·	·	·	1	**-0.14**	**0.07**	-0.03	**-0.18**	**0.14**	**-0.13**	**0.07**	0.02	**-0.12**	**-0.13**	0.06	**0.22**
Net income > €2500	·	·	·	·	·	·	·	·	1	**-0.25**	0.02	**0.23**	**-0.15**	**0.24**	**0.09**	0.04	**-0.10**	**0.29**	**0.23**	**-0.12**
Net income missing	·	·	·	·	·	·	·	·	·	1	**-0.08**	**-0.08**	**0.23**	-0.05	0.06	0.02	**-0.08**	0.03	**0.11**	-0.04
Financial wealth ∈ (€10000, €30000]	·	·	·	·	·	·	·	·	·	·	1	**-0.37**	**-0.29**	0.03	0.00	**-0.06**	0.05	0.01	-0.01	0.00
Financial wealth ∈ (€30000, ∞)	·	·	·	·	·	·	·	·	·	·	·	1	**-0.29**	**0.16**	**-0.13**	**0.13**	0.05	**0.10**	-0.04	**-0.07**
Financial wealth missing	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.09**	**0.09**	-0.01	**-0.07**	-0.00	0.02	0.05
High education	·	·	·	·	·	·	·	·	·	·	·	·	·	1	0.04	-0.02	**-0.09**	**-0.07**	0.04	**-0.16**
30 < Age ≤ 50	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.46**	**-0.42**	-0.04	**0.42**	**-0.09**
50 < Age ≤ 65	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.49**	**0.07**	0.03	-0.00
Age > 65	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**0.07**	**-0.39**	**0.14**
Married	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**0.22**	0.03
Has children	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.07**
Risk aversion	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1

Sources: LISS panel / yahoo! finance / Statistics Netherlands / own calculations. The table shows pairwise Pearson correlations between the belief moments and sociodemographics. Belief moments are calculated using data from August 2013. Correlations printed in bold are significantly different from zero at the 1 percent level.

Table B.7: Pairwise correlations between belief measures and sociodemographics — March 2014

	μ_{AEX}	σ_{AEX}	γ_{AEX}	μ_{Philips}	σ_{Philips}	γ_{Philips}	Exp. return for savings account	Female	Net income > €2500	Net income missing	Financial wealth ∈ (€10000, €30000]	Financial wealth ∈ (€30000, ∞)	Financial wealth missing	High education	30 < Age ≤ 50	50 < Age ≤ 65	Age > 65	Married	Has children	Risk aversion
μ_{AEX}	1	**-0.09**	**0.13**	**0.46**	0.05	0.03	**-0.06**	**-0.13**	**0.12**	-0.02	-0.00	**0.13**	**-0.11**	**0.08**	0.03	0.05	**-0.08**	0.02	0.04	**-0.14**
σ_{AEX}	·	1	**-0.09**	**0.06**	**0.54**	**0.12**	**0.14**	**0.09**	**-0.06**	0.03	-0.00	**-0.12**	**0.07**	**-0.11**	0.03	**-0.08**	0.03	-0.02	-0.02	0.00
γ_{AEX}	·	·	1	**0.08**	0.01	**0.16**	-0.00	-0.04	-0.00	-0.00	0.03	0.01	-0.03	0.02	-0.04	-0.02	0.04	-0.00	0.01	-0.03
μ_{Philips}	·	·	·	1	**0.48**	**0.07**	**0.06**	**-0.07**	**0.08**	-0.03	-0.02	**0.08**	**-0.07**	0.00	-0.02	0.01	0.01	0.03	0.01	-0.04
σ_{Philips}	·	·	·	·	1	**0.23**	**0.17**	0.02	-0.02	0.01	-0.04	**-0.07**	0.04	**-0.09**	0.02	**-0.07**	0.03	-0.02	-0.03	-0.02
γ_{Philips}	·	·	·	·	·	1	0.03	0.00	-0.03	-0.01	0.01	-0.03	0.01	-0.03	-0.04	-0.04	**0.08**	-0.02	-0.05	-0.00
Exp. return for savings account	·	·	·	·	·	·	1	**0.17**	**-0.08**	-0.02	0.00	**-0.15**	**0.07**	**-0.13**	**0.09**	**-0.10**	-0.02	**-0.08**	0.01	0.02
Female	·	·	·	·	·	·	·	1	**-0.14**	**0.07**	-0.03	**-0.18**	**0.14**	**-0.13**	**0.07**	0.02	**-0.12**	**-0.13**	0.06	**0.22**
Net income > €2500	·	·	·	·	·	·	·	·	1	**-0.25**	0.02	**0.23**	**-0.15**	**0.24**	**0.09**	0.04	**-0.10**	**0.29**	**0.23**	**-0.12**
Net income missing	·	·	·	·	·	·	·	·	·	1	**-0.08**	**-0.08**	**0.23**	-0.05	0.06	0.02	**-0.08**	0.03	**0.11**	-0.04
Financial wealth ∈ (€10000, €30000]	·	·	·	·	·	·	·	·	·	·	1	**-0.37**	**-0.29**	0.03	0.00	**-0.06**	0.05	0.01	-0.01	0.00
Financial wealth ∈ (€30000, ∞)	·	·	·	·	·	·	·	·	·	·	·	1	**-0.29**	**0.16**	**-0.13**	**0.13**	0.05	**0.10**	-0.04	**-0.07**
Financial wealth missing	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.09**	**0.09**	-0.01	**-0.07**	-0.00	0.02	0.05
High education	·	·	·	·	·	·	·	·	·	·	·	·	·	1	0.04	-0.02	**-0.09**	**-0.07**	0.04	**-0.16**
30 < Age ≤ 50	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.46**	**-0.42**	-0.04	**0.42**	**-0.09**
50 < Age ≤ 65	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.49**	**0.07**	0.03	-0.00
Age > 65	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**0.07**	**-0.39**	**0.14**
Married	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**0.22**	0.03
Has children	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**-0.07**
Risk aversion	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1

Sources: LISS panel / yahoo! finance / Statistics Netherlands / own calculations. The table shows pairwise Pearson correlations between the belief moments and sociodemographics. Belief moments are calculated using data from March 2014. Correlations printed in bold are significantly different from zero at the 1 percent level.

Table B.8: Determinants of mean expectations

	Expected Mean Return	
	AEX	Philips
	(1)	(2)
Constant	2.90***	6.49***
	(0.59)	(1.09)
Female	−1.63***	−1.23**
	(0.31)	(0.53)
Net income > €2500	0.83***	0.56
	(0.33)	(0.56)
Net income missing	0.46	−1.18
	(0.59)	(0.89)
Financial wealth ∈ (€10000, €30000]	0.06	−0.45
	(0.38)	(0.64)
Financial wealth ∈ (€30000, ∞)	1.13***	0.53
	(0.40)	(0.70)
Financial wealth missing	−1.30***	−1.03
	(0.47)	(0.75)
High education	0.34	−0.43
	(0.31)	(0.51)
30 < Age ≤ 50	0.50	−1.51
	(0.59)	(1.08)
50 < Age ≤ 65	0.27	−1.34
	(0.57)	(1.04)
Age > 65	−0.95*	−1.46
	(0.58)	(1.06)
Married	−0.20	−0.16
	(0.32)	(0.52)
Has children	−0.08	0.41
	(0.36)	(0.70)
Observations	1,857	1,857
Adjusted R^2 (%)	5.10	0.50

Sources: LISS panel and own calculations. The table shows cross-sectional regressions of the mean of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the covariates. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.9: Determinants of standard deviation of expectations

	Expected Standard Deviation	
	AEX	Philips
	(1)	(2)
Constant	8.29***	12.73***
	(0.38)	(0.68)
Female	0.25	0.09
	(0.16)	(0.29)
Net income > €2500	0.00	0.46
	(0.17)	(0.32)
Net income missing	–0.16	–0.32
	(0.30)	(0.56)
Financial wealth $\in$ (€10000, €30000]	–0.37*	–0.68*
	(0.20)	(0.37)
Financial wealth $\in$ (€30000, ∞)	–0.66***	–0.59
	(0.21)	(0.40)
Financial wealth missing	0.06	–0.28
	(0.25)	(0.42)
High education	–0.37**	–0.91***
	(0.17)	(0.30)
$30 < \text{Age} \leq 50$	–0.21	–1.81***
	(0.37)	(0.70)
$50 < \text{Age} \leq 65$	–0.65*	–2.13***
	(0.36)	(0.69)
$\text{Age} > 65$	–0.31	–1.81***
	(0.37)	(0.69)
Married	–0.03	–0.12
	(0.17)	(0.30)
Has children	–0.17	–0.31
	(0.20)	(0.36)
Observations	1,857	1,857
Adjusted R^2 (%)	1.50	0.80

Sources: LISS panel and own calculations. The table shows cross-sectional regressions of the standard deviation of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the covariates. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.10: Determinants of mean expectations: more variables

	Expected Mean Return	
	AEX	Philips
	(1)	(2)
Constant	2.41***	7.43***
	(0.80)	(1.51)
Female	−0.87**	−0.35
	(0.36)	(0.62)
Net income $>$ €2500	0.30	−0.10
	(0.39)	(0.65)
Net income missing	−0.15	−1.91
	(1.04)	(1.64)
Financial wealth $\in$ (€10000, €30000]	−0.65	−0.84
	(0.41)	(0.70)
Financial wealth $\in$ (€30000, ∞)	−0.26	0.13
	(0.50)	(0.83)
Financial wealth missing	0.00	0.00
	(0.00)	(0.00)
High education	−0.25	−0.90
	(0.38)	(0.61)
$30 < \text{Age} \leq 50$	1.27*	−2.38*
	(0.69)	(1.41)
$50 < \text{Age} \leq 65$	0.75	−1.95
	(0.66)	(1.37)
$\text{Age} > 65$	0.15	−1.77
	(0.70)	(1.44)
Married	−0.22	0.01
	(0.38)	(0.60)
Has children	−0.06	1.01
	(0.45)	(0.87)
Risk aversion	−0.54***	−0.33
	(0.19)	(0.30)
Financial numeracy	0.53***	0.53
	(0.20)	(0.33)
Holds stocks or funds	2.44***	0.58
	(0.57)	(0.77)
Main source financial advice: internet	0.65	−0.11
	(0.51)	(0.85)
Main source financial advice: newspaper/books	0.48	0.22
	(0.66)	(0.94)
Main source financial advice: parents/friends	−0.50	−1.14
	(0.50)	(0.85)
Main source financial advice: other	0.32	−0.24
	(0.54)	(0.92)
Observations	1,318	1,318
Adjusted R^2 (%)	7.10	0.10

Sources: LISS panel and own calculations. The table shows cross-sectional regressions of the mean of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the demographic covariates and Section B.2 for financial numeracy and financial advice. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.11: Determinants of standard deviation of expectations: more variables

	Expected Standard Deviation	
	AEX (1)	Philips (2)
Constant	7.90***	13.03***
	(0.47)	(0.89)
Female	0.43**	0.38
	(0.19)	(0.36)
Net income > €2500	−0.03	0.60
	(0.20)	(0.38)
Net income missing	−0.85**	−1.08
	(0.41)	(0.88)
Financial wealth ∈ (€10000, €30000]	−0.30	−0.47
	(0.21)	(0.40)
Financial wealth ∈ (€30000, ∞)	−0.60***	−0.35
	(0.24)	(0.48)
Financial wealth missing	0.00***	0.00*
	(0.00)	(0.00)
High education	−0.21	−0.79**
	(0.19)	(0.37)
30 < Age ≤ 50	−0.24	−2.69***
	(0.42)	(0.86)
50 < Age ≤ 65	−0.63	−2.70***
	(0.42)	(0.85)
Age > 65	−0.29	−1.99**
	(0.44)	(0.86)
Married	0.07	−0.21
	(0.19)	(0.36)
Has children	0.17	0.29
	(0.23)	(0.44)
Risk aversion	−0.14	−0.25
	(0.10)	(0.17)
Financial numeracy	−0.42***	−0.47**
	(0.12)	(0.19)
Holds stocks or funds	0.06	0.09
	(0.25)	(0.48)
Main source financial advice: internet	−0.01	−0.45
	(0.26)	(0.49)
Main source financial advice: newspaper/books	0.88***	−0.05
	(0.31)	(0.60)
Main source financial advice: parents/friends	−0.08	−0.16
	(0.24)	(0.47)
Main source financial advice: other	0.43	−0.07
	(0.31)	(0.57)
Observations	1,318	1,318
Adjusted R^2 (%)	3.40	1.40

Sources: LISS panel and own calculations. The table shows cross-sectional regressions of the standard deviation of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the demographic covariates and Section B.2 for financial numeracy and financial advice. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.12: Determinants of skewness expectation: more variables

	Expected Skewness	
	AEX	Philips
	(1)	(2)
Constant	0.44***	1.45***
	(0.15)	(0.21)
Female	−0.06	0.21*
	(0.07)	(0.11)
Net income > €2500	−0.03	0.11
	(0.07)	(0.11)
Net income missing	−0.11	0.27
	(0.15)	(0.36)
Financial wealth ∈ (€10000, €30000]	0.00	0.04
	(0.08)	(0.12)
Financial wealth ∈ (€30000, ∞)	0.05	0.03
	(0.09)	(0.14)
Financial wealth missing	0.00	0.00
	(0.00)	(0.00)
High education	−0.11	−0.08
	(0.07)	(0.11)
30 < Age ≤ 50	−0.04	0.10
	(0.12)	(0.18)
50 < Age ≤ 65	0.00	0.21
	(0.12)	(0.18)
Age > 65	0.10	0.35**
	(0.12)	(0.18)
Married	−0.04	−0.10
	(0.07)	(0.11)
Has children	0.05	−0.01
	(0.08)	(0.13)
Risk aversion	0.04	−0.01
	(0.03)	(0.06)
Financial numeracy	0.00	0.05
	(0.04)	(0.05)
Holds stocks or funds	−0.01	−0.10
	(0.08)	(0.14)
Main source financial advice: internet	0.01	−0.24*
	(0.09)	(0.15)
Main source financial advice: newspaper/books	−0.04	0.26
	(0.10)	(0.18)
Main source financial advice: parents/friends	−0.08	0.00
	(0.09)	(0.14)
Main source financial advice: other	−0.10	−0.07
	(0.10)	(0.17)
Observations	1,318	1,318
Adjusted R^2 (%)	−0.50	0.40

Sources: LISS panel and own calculations. The table shows cross-sectional regressions of the skewness of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the demographic covariates and Section B.2 for financial numeracy and financial advice. Heteroskedasticity-robust standard errors are reported in parentheses.

B.3.5 Determinants of changes in belief moments

In this section, we try to explain the changes in belief parameters. The first three tables focus only on demographic characteristics while the next three tables addtionally add four additional variables as independent variables: risk aversion, financial literacy, financial advice and a dummy variable indicating if the subject invests in any stocks or funds. Section B.2 provides definitions for financial numeracy and financial advice. Due to non-response by a small number of respondents in the respective questionnaire and item non-response to the questions about stock market participation, the regressions are based on $1,318$ observations. In the first two columns in each table, the dependent variable is an indicator for "Any change" of this parameter and in columns 3 and 4, the independent variables is just the continuous difference between the two elicitations. Note that the results for the dependent variable "Any change" are very similar across tables as changing one's beliefs usually implies a change in expected mean, standard deviation, and skewness.

Table B.13: Determinants of changes in mean expectations

	Any Change in Expected Mean Return		Δ Expected Mean Return	
	AEX	Philips	AEX	Philips
	(1)	(2)	(3)	(4)
Constant	0.42***	0.44***	0.45	−2.21***
	(0.05)	(0.05)	(0.29)	(0.83)
Female	−0.03	−0.03	0.36**	0.31
	(0.02)	(0.02)	(0.16)	(0.32)
Net income > €2500	0.03	0.01	−0.03	0.52
	(0.03)	(0.03)	(0.16)	(0.35)
Net income missing	−0.07	−0.03	−0.04	1.12***
	(0.05)	(0.05)	(0.22)	(0.29)
Financial wealth ∈ (€10000, €30000]	0.04	0.03	0.06	−0.01
	(0.03)	(0.03)	(0.20)	(0.37)
Financial wealth ∈ (€30000, ∞)	0.10***	0.07**	−0.07	0.12
	(0.03)	(0.03)	(0.19)	(0.38)
Financial wealth missing	−0.10***	−0.11***	0.21	0.06
	(0.03)	(0.03)	(0.23)	(0.41)
High education	0.10***	0.10***	−0.01	−0.10
	(0.03)	(0.03)	(0.16)	(0.31)
$30 < \text{Age} \leq 50$	0.04	0.03	−0.09	1.07
	(0.05)	(0.05)	(0.27)	(0.82)
$50 < \text{Age} \leq 65$	0.10*	0.08	−0.05	1.00
	(0.05)	(0.05)	(0.26)	(0.80)
Age > 65	0.08	0.06	−0.01	1.23
	(0.05)	(0.05)	(0.28)	(0.80)
Married	−0.02	−0.02	0.11	0.17
	(0.03)	(0.03)	(0.15)	(0.30)
Has children	−0.03	−0.03	−0.08	−0.32
	(0.03)	(0.03)	(0.19)	(0.39)
Observations	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	4.20	3.40	−0.10	0.00

Sources: LISS panel and own calculations. The table shows regressions of changes of the mean of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the demographic covariates and Section B.2 for financial numeracy and financial advice. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.14: Determinants of changes in standard deviation of expectations

	Any Change in Expected Standard Deviation		Δ Expected Standard Deviation	
	AEX (1)	Philips (2)	AEX (3)	Philips (4)
Constant	0.42***	0.44***	−0.49***	−1.66***
	(0.05)	(0.05)	(0.16)	(0.49)
Female	−0.03	−0.03	0.13	−0.09
	(0.02)	(0.02)	(0.08)	(0.17)
Net income $>$ €2500	0.03	0.01	0.01	−0.08
	(0.03)	(0.03)	(0.09)	(0.20)
Net income missing	−0.06	−0.03	0.25*	0.61***
	(0.05)	(0.05)	(0.13)	(0.20)
Financial wealth $\in$ (€10000, €30000]	0.04	0.03	0.13	−0.25
	(0.03)	(0.03)	(0.10)	(0.22)
Financial wealth $\in$ (€30000, ∞)	0.10***	0.07**	−0.03	−0.43*
	(0.03)	(0.03)	(0.11)	(0.24)
Financial wealth missing	−0.10***	−0.12***	0.05	0.09
	(0.03)	(0.03)	(0.13)	(0.24)
High education	0.10***	0.10***	−0.21**	−0.06
	(0.03)	(0.03)	(0.09)	(0.20)
$30 < \text{Age} \leq 50$	0.04	0.03	−0.04	0.95**
	(0.05)	(0.05)	(0.16)	(0.49)
$50 < \text{Age} \leq 65$	0.10*	0.07	−0.02	0.56
	(0.05)	(0.05)	(0.15)	(0.49)
Age > 65	0.08	0.06	0.08	0.95**
	(0.05)	(0.05)	(0.15)	(0.49)
Married	−0.02	−0.01	0.03	0.06
	(0.03)	(0.03)	(0.08)	(0.17)
Has children	−0.03	−0.03	0.03	−0.15
	(0.03)	(0.03)	(0.10)	(0.22)
Observations	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	4.00	3.40	0.40	0.60

Sources: LISS panel and own calculations. The table shows regressions of changes of the standard deviation of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the demographic covariates and Section B.2 for financial numeracy and financial advice. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.15: Determinants of changes in skewness expectations

	Any Change in Expected Skewness		Δ Expected Skewness	
	AEX	Philips	AEX	Philips
	(1)	(2)	(3)	(4)
Constant	0.42***	0.44***	−0.03	0.18
	(0.05)	(0.05)	(0.07)	(0.12)
Female	−0.03	−0.03	−0.02	−0.12*
	(0.02)	(0.02)	(0.03)	(0.06)
Net income > €2500	0.03	0.01	0.00	−0.07
	(0.03)	(0.03)	(0.04)	(0.07)
Net income missing	−0.06	−0.03	0.07	0.00
	(0.05)	(0.05)	(0.05)	(0.10)
Financial wealth ∈ (€10000, €30000]	0.04	0.03	0.08**	0.05
	(0.03)	(0.03)	(0.04)	(0.09)
Financial wealth ∈ (€30000, ∞)	0.10***	0.07**	−0.03	−0.06
	(0.03)	(0.03)	(0.05)	(0.09)
Financial wealth missing	−0.10***	−0.12***	−0.01	0.10
	(0.03)	(0.03)	(0.05)	(0.08)
High education	0.09***	0.10***	0.12***	−0.06
	(0.03)	(0.03)	(0.03)	(0.07)
30 < Age ≤ 50	0.04	0.03	−0.02	−0.08
	(0.05)	(0.05)	(0.06)	(0.11)
50 < Age ≤ 65	0.09*	0.07	−0.08	−0.31***
	(0.05)	(0.05)	(0.06)	(0.12)
Age > 65	0.08	0.06	−0.06	−0.23**
	(0.05)	(0.05)	(0.07)	(0.12)
Married	−0.02	−0.01	0.01	−0.01
	(0.03)	(0.03)	(0.04)	(0.06)
Has children	−0.03	−0.03	−0.02	−0.15*
	(0.03)	(0.03)	(0.04)	(0.08)
Observations	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	4.10	3.40	0.80	0.70

Sources: LISS panel and own calculations. The table shows regressions of changes of the skewness of the expected return distributions for the AEX and Philips on sociodemographic covariates. Section A.6 provides definitions for the demographic covariates and Section B.2 for financial numeracy and financial advice. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.16: Determinants of changes in mean expectations: more variables

	Any Change in Expected Mean Return		Δ Expected Mean Return	
	AEX (1)	Philips (2)	AEX (3)	Philips (4)
Constant	0.38***	0.36***	0.51	−2.59**
	(0.07)	(0.07)	(0.37)	(1.12)
Female	0.01	0.02	0.32*	−0.22
	(0.03)	(0.03)	(0.18)	(0.38)
Net income > €2500	0.01	0.00	−0.11	0.59
	(0.03)	(0.03)	(0.19)	(0.38)
Net income missing	−0.08	0.03	0.15	1.07***
	(0.07)	(0.07)	(0.31)	(0.41)
Financial wealth ∈ (€10000, €30000]	0.03	0.00	0.16	0.06
	(0.03)	(0.03)	(0.21)	(0.40)
Financial wealth ∈ (€30000, ∞)	0.07*	0.02	0.12	0.10
	(0.04)	(0.04)	(0.25)	(0.52)
Financial wealth missing	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
High education	0.04	0.05*	0.00	0.23
	(0.03)	(0.03)	(0.20)	(0.36)
$30 < \text{Age} \leq 50$	0.05	0.06	0.05	1.85*
	(0.06)	(0.07)	(0.32)	(1.09)
$50 < \text{Age} \leq 65$	0.12*	0.12*	−0.01	1.27
	(0.06)	(0.06)	(0.32)	(1.09)
$\text{Age} > 65$	0.13**	0.16***	0.04	1.34
	(0.06)	(0.07)	(0.34)	(1.11)
Married	−0.03	−0.02	0.11	0.28
	(0.03)	(0.03)	(0.19)	(0.35)
Has children	−0.02	−0.05	−0.16	−0.64
	(0.04)	(0.04)	(0.24)	(0.48)
Risk aversion	0.01	0.01	0.17*	0.20
	(0.01)	(0.01)	(0.10)	(0.17)
Financial numeracy	0.10***	0.08***	0.22**	−0.43***
	(0.02)	(0.02)	(0.09)	(0.17)
Holds stocks or funds	0.05	0.09**	−0.38	0.06
	(0.04)	(0.04)	(0.34)	(0.45)
Main source financial advice: internet	0.08*	0.07*	−0.04	0.10
	(0.04)	(0.04)	(0.29)	(0.50)
Main source financial advice: newspaper/books	0.03	−0.01	−0.16	0.33
	(0.05)	(0.05)	(0.25)	(0.52)
Main source financial advice: parents/friends	0.04	0.08**	−0.04	−0.05
	(0.04)	(0.04)	(0.24)	(0.50)
Main source financial advice: other	0.00	0.00	−0.26	0.49
	(0.04)	(0.04)	(0.28)	(0.49)
Observations	1,318	1,318	1,318	1,318
Adjusted R^2 (%)	5.30	4.00	0.10	0.00

Table B.17: Determinants of changes in standard deviation of expectations: more variables

	Any Change in Expected Standard Deviation		Δ Expected Standard Deviation	
	AEX	Philips	AEX	Philips
	(1)	(2)	(3)	(4)
Constant	0.38^{***}	0.37^{***}	−0.24	-2.08^{***}
	(0.07)	(0.07)	(0.18)	(0.69)
Female	0.01	0.02	0.06	−0.26
	(0.03)	(0.03)	(0.10)	(0.22)
Net income > €2500	0.00	0.00	−0.02	−0.19
	(0.03)	(0.03)	(0.10)	(0.22)
Net income missing	−0.08	0.03	0.32^{*}	0.62^{**}
	(0.07)	(0.07)	(0.17)	(0.29)
Financial wealth ∈ (€10000, €30000]	0.03	0.00	0.07	−0.29
	(0.03)	(0.03)	(0.10)	(0.24)
Financial wealth ∈ (€30000, ∞)	0.06	0.02	−0.06	−0.35
	(0.04)	(0.04)	(0.13)	(0.30)
Financial wealth missing	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
High education	0.04	0.05	−0.06	0.11
	(0.03)	(0.03)	(0.10)	(0.24)
30 < Age ≤ 50	0.04	0.06	−0.17	1.12^{*}
	(0.06)	(0.07)	(0.16)	(0.65)
50 < Age ≤ 65	0.12^{*}	0.12^{*}	−0.20	0.61
	(0.06)	(0.06)	(0.16)	(0.67)
Age > 65	0.13^{**}	0.16^{***}	−0.10	0.90
	(0.06)	(0.07)	(0.16)	(0.68)
Married	−0.03	−0.02	0.02	0.19
	(0.03)	(0.03)	(0.09)	(0.22)
Has children	−0.02	−0.05	−0.08	0.00
	(0.04)	(0.04)	(0.12)	(0.25)
Risk aversion	0.01	0.01	0.03	−0.01
	(0.01)	(0.01)	(0.05)	(0.10)
Financial numeracy	0.10^{***}	0.08^{***}	−0.06	-0.33^{***}
	(0.02)	(0.02)	(0.05)	(0.10)
Holds stocks or funds	0.05	0.09^{**}	−0.05	−0.01
	(0.04)	(0.04)	(0.13)	(0.28)
Main source financial advice: internet	0.08^{*}	0.08^{*}	−0.07	0.37
	(0.04)	(0.04)	(0.13)	(0.31)
Main source financial advice: newspaper/books	0.03	−0.01	−0.12	0.64^{*}
	(0.05)	(0.05)	(0.15)	(0.35)
Main source financial advice: parents/friends	0.03	0.08^{*}	−0.09	0.18
	(0.04)	(0.04)	(0.13)	(0.32)
Main source financial advice: other	0.00	−0.01	0.07	0.55^{*}
	(0.04)	(0.04)	(0.12)	(0.31)
Observations	1,318	1,318	1,318	1,318
Adjusted R^2 (%)	5.00	3.80	0.00	0.90

Table B.18: Determinants of changes in skewness expectations: more variables

	Any Change in Expected Skewness		Δ Expected Skewness	
	AEX	Philips	AEX	Philips
	(1)	(2)	(3)	(4)
Constant	0.38***	0.37***	−0.15	0.19
	(0.07)	(0.07)	(0.10)	(0.17)
Female	0.01	0.02	0.00	−0.13
	(0.03)	(0.03)	(0.05)	(0.09)
Net income > €2500	0.01	0.00	−0.02	−0.14*
	(0.03)	(0.03)	(0.04)	(0.08)
Net income missing	−0.08	0.03	0.10	−0.10
	(0.07)	(0.07)	(0.09)	(0.16)
Financial wealth ∈ (€10000, €30000]	0.03	0.00	0.09**	0.04
	(0.03)	(0.03)	(0.04)	(0.09)
Financial wealth ∈ (€30000, ∞)	0.06	0.02	−0.02	−0.05
	(0.04)	(0.04)	(0.06)	(0.11)
Financial wealth missing	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
High education	0.04	0.04	0.11***	−0.02
	(0.03)	(0.03)	(0.04)	(0.08)
30 < Age ≤ 50	0.04	0.05	−0.01	−0.13
	(0.06)	(0.07)	(0.08)	(0.15)
50 < Age ≤ 65	0.12*	0.12*	−0.03	−0.38***
	(0.06)	(0.06)	(0.08)	(0.15)
Age > 65	0.13**	0.16**	−0.03	−0.28*
	(0.06)	(0.07)	(0.09)	(0.16)
Married	−0.03	−0.02	0.03	−0.01
	(0.03)	(0.03)	(0.05)	(0.08)
Has children	−0.02	−0.05	0.02	−0.11
	(0.04)	(0.04)	(0.04)	(0.10)
Risk aversion	0.01	0.01	−0.06***	0.01
	(0.01)	(0.01)	(0.02)	(0.04)
Financial numeracy	0.10***	0.08***	−0.04**	−0.01
	(0.02)	(0.02)	(0.02)	(0.04)
Holds stocks or funds	0.05	0.09***	0.04	0.11
	(0.04)	(0.04)	(0.06)	(0.11)
Main source financial advice: internet	0.08*	0.08*	0.13**	0.09
	(0.04)	(0.04)	(0.06)	(0.12)
Main source financial advice: newspaper/books	0.03	−0.01	0.00	−0.07
	(0.05)	(0.05)	(0.07)	(0.15)
Main source financial advice: parents/friends	0.03	0.08**	0.04	0.03
	(0.04)	(0.04)	(0.06)	(0.12)
Main source financial advice: other	0.00	−0.01	0.10	0.13
	(0.04)	(0.04)	(0.06)	(0.12)
Observations	1,318	1,318	1,318	1,318
Adjusted R^2 (%)	5.10	3.80	1.60	0.10

B.4 Historical return distributions and moments for the AEX and Philips

To estimate the historical moments for the return distributions of the AEX and Philips, we first obtain return data from *yahoo!* finance (Link to Philips data, Link to AEX data). For both assets and each month of available data before 2013 (since 1988 for Philips, since 1993 for the AEX), we then calculate the 1-year return over the subsequent year. This gives us the distribution of returns an investor would have experienced for a 1-year investment made in a random month. Since we are working with a period involving times of heightened levels of inflation, we calculate these returns in excess of the rate of inflation, which we obtain from Statistics Netherlands (Link).

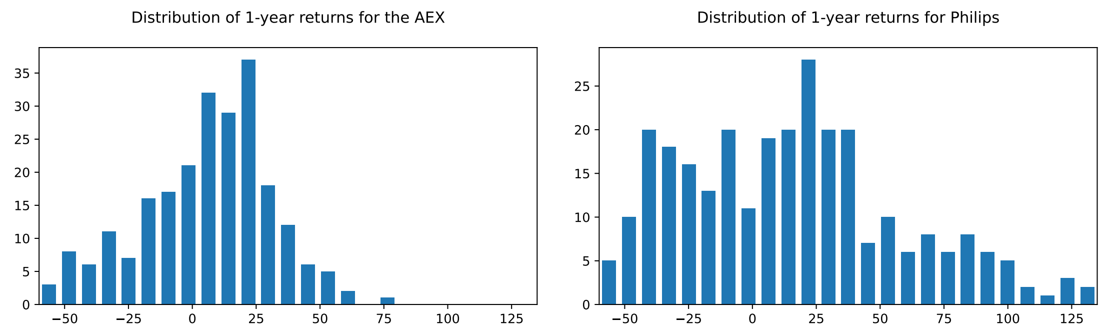


Figure B.5: Historical distributions of 1-year returns for both assets

Sources: Own calculations / yahoo! finance / Statistics Netherlands. The figure shows the distributions of the 1-year returns an investor would have experienced upon investing into either the AEX (left) or Philips (right) in a random month. Returns are expressed in excess of the rate of inflation.

For both assets, we then calculate several moments of the empirical return distribution for the available months T. Specifically, we calculate the empirical mean μ_{Emp} and standard deviation σ_{Emp} of an asset's inflation-adjusted 1-year returns r as

$$\mu_{Emp} = \frac{1}{T}\sum_{t=1}^{T} r_t \quad \text{and} \quad \sigma_{Emp} = \Big(\frac{1}{T}\sum_{t=1}^{T}(r_t - \mu_{Emp})^2\Big)^{1/2},$$

as well as the expected skewness γ_{Emp} as

$$\gamma_{Emp} = \frac{1}{T}\sum_{t=1}^{T}(\frac{r_t - \mu_{Emp}}{\sigma_{Emp}})^3.$$

For the AEX, we obtain $\mu_{\text{AEX,Emp}} = 5.57$, $\sigma_{\text{AEX,Emp}} = 25.54$, and $\gamma_{\text{AEX,Emp}} = -0.33$. For Philips, we obtain $\mu_{\text{Philips,Emp}} = 16.12$, $\sigma_{\text{Philips,Emp}} = 45.61$, and $\gamma_{\text{Philips,Emp}} = 0.67$.

B.5 Remaining coefficients for main regression tables

Table B.19: Expectations and portfolio choice — remaining coefficients

	Portfolio Share					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	27.62***	26.80***	28.86***	28.49***	27.56***	29.55***
	(3.30)	(3.33)	(3.42)	(2.83)	(2.85)	(3.08)
Female	−6.26***	−6.23***	−6.10***	−0.71	−0.80	−0.64
	(1.26)	(1.26)	(1.25)	(1.11)	(1.11)	(1.12)
Net income > €2500	2.36*	2.41*	2.45*	−1.34	−1.38	−1.31
	(1.39)	(1.39)	(1.38)	(1.28)	(1.28)	(1.28)
Net income missing	−0.63	−0.55	−1.10	−3.54	−3.48	−3.65*
	(2.42)	(2.43)	(2.40)	(2.24)	(2.22)	(2.24)
Financial wealth ∈ (€10000, €30000]	1.95	1.97	1.77	−1.68	−1.65	−1.72
	(1.53)	(1.53)	(1.52)	(1.45)	(1.45)	(1.44)
Financial wealth ∈ (€30000, ∞)	4.43***	4.41***	4.21***	−2.70*	−2.68*	−2.82*
	(1.69)	(1.69)	(1.68)	(1.58)	(1.57)	(1.57)
Financial wealth missing	−0.70	−0.72	−0.74	−1.52	−1.42	−1.58
	(1.77)	(1.77)	(1.75)	(1.62)	(1.62)	(1.62)
High education	3.78***	3.89***	3.47***	0.08	0.07	−0.15
	(1.36)	(1.37)	(1.35)	(1.23)	(1.23)	(1.23)
$30 < \text{Age} \leq 50$	7.80***	8.00***	7.14***	2.24	2.21	2.34
	(2.83)	(2.83)	(2.80)	(2.56)	(2.56)	(2.54)
$50 < \text{Age} \leq 65$	8.59***	8.68***	7.68***	2.87	2.61	2.32
	(2.76)	(2.76)	(2.74)	(2.53)	(2.53)	(2.53)
$\text{Age} > 65$	6.89***	6.86***	6.07**	8.15***	7.72***	7.35***
	(2.77)	(2.77)	(2.77)	(2.55)	(2.55)	(2.54)
Married	−4.91***	−4.87***	−4.96***	0.77	0.81	0.68
	(1.34)	(1.34)	(1.33)	(1.19)	(1.19)	(1.19)
Has children	0.72	0.57	0.66	−2.09	−2.20	−2.26
	(1.64)	(1.64)	(1.61)	(1.48)	(1.47)	(1.47)
Beliefs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	10.07	10.20	11.40	6.02	6.39	6.77

Sources: LISS panel and own calculations. The table contains the missing controls for the regression results reported in Table 4 of the main text. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.20: Changes in expectations and portfolio dynamics — remaining coefficients

	Change in Portfolio Share					
	Δ_{AEX}			$\Delta_{Philips}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.80***	4.78***	4.29***	–1.38	–1.63	–1.80
	(1.52)	(1.52)	(1.43)	(1.45)	(1.45)	(1.44)
Female	–0.35	–0.35	–0.43	–0.28	–0.18	–0.20
	(0.67)	(0.67)	(0.66)	(0.65)	(0.64)	(0.64)
Net income > €2500	–1.23	–1.24	–1.10	0.40	0.43	0.48
	(0.77)	(0.77)	(0.75)	(0.73)	(0.72)	(0.72)
Net income missing	–1.10	–1.08	–0.76	–0.32	–0.33	–0.27
	(1.02)	(1.02)	(1.00)	(0.90)	(0.89)	(0.89)
Financial wealth ∈ (€10000, €30000]	0.81	0.84	0.81	–0.45	–0.54	–0.49
	(0.87)	(0.86)	(0.84)	(0.78)	(0.77)	(0.77)
Financial wealth ∈ (€30000, ∞)	0.41	0.39	0.43	0.69	0.69	0.77
	(0.96)	(0.96)	(0.96)	(0.96)	(0.95)	(0.95)
Financial wealth missing	–0.94	–0.94	–0.85	0.81	0.70	0.67
	(0.90)	(0.89)	(0.87)	(0.89)	(0.87)	(0.86)
High education	1.12	1.17	1.08	–0.65	–0.59	–0.72
	(0.76)	(0.75)	(0.74)	(0.70)	(0.71)	(0.70)
$30 < \text{Age} \leq 50$	–2.07	–2.07	–1.75	0.55	0.68	0.60
	(1.42)	(1.42)	(1.33)	(1.40)	(1.39)	(1.37)
$50 < \text{Age} \leq 65$	–2.36*	–2.38*	–2.30*	2.14	2.47*	2.45*
	(1.38)	(1.38)	(1.30)	(1.41)	(1.39)	(1.38)
$\text{Age} > 65$	–3.21**	–3.22**	–3.02**	1.64	1.92	1.88
	(1.44)	(1.44)	(1.36)	(1.43)	(1.42)	(1.41)
Married	0.70	0.71	0.73	–0.05	–0.04	–0.06
	(0.71)	(0.70)	(0.69)	(0.67)	(0.66)	(0.67)
Has children	–0.38	–0.39	–0.65	0.10	0.27	0.30
	(0.87)	(0.87)	(0.84)	(0.80)	(0.79)	(0.79)
Beliefs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	1.96	1.94	4.67	3.01	3.95	4.32

Sources: LISS panel and own calculations. The table contains the missing controls for the regression results reported in Table 5 of the main text. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6 Robustness

B.6.1 Alternative estimation of belief moments

B.6.1.1 Alternative bounds for extreme bins

Table B.21 and Table B.22 show the main results when we set the extreme bounds of the outer bins to the 2.5% and 97.5% quantiles of the respective assets' historical distributions.

Table B.21: Expectations and portfolio choice — alternative bounds

	Portfolio Share					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	27.84***	26.89***	28.96***	28.35***	27.44***	29.48***
	(3.25)	(3.29)	(3.38)	(2.82)	(2.84)	(3.04)
μ_{AEX}	0.62***	0.60***	0.76***			–0.19*
	(0.11)	(0.11)	(0.11)			(0.11)
σ_{AEX}	–0.03	0.02	0.25			–0.14
	(0.17)	(0.17)	(0.20)			(0.19)
γ_{AEX}		1.04**	1.16**			0.25
		(0.49)	(0.49)			(0.51)
μ_{Philips}			–0.19***	0.28***	0.30***	0.33***
			(0.08)	(0.08)	(0.08)	(0.09)
σ_{Philips}			–0.18	0.16	0.13	0.17
			(0.12)	(0.10)	(0.10)	(0.12)
γ_{Philips}			0.15		0.71***	0.71***
			(0.29)		(0.26)	(0.26)
Exp. return for savings account			–0.16			–0.25***
			(0.10)			(0.10)
Risk aversion	–2.50***	–2.53***	–2.47***	–3.30***	–3.27***	–3.45***
	(0.63)	(0.62)	(0.62)	(0.59)	(0.59)	(0.59)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	9.94	10.12	11.33	5.79	6.09	6.44

Sources: LISS panel and own calculations. The results in this table differ from those reported in the main text in the assumptions we make concerning the outer bounds for the extreme bins. In the main text, we set them to the values a €100 investment would have returned at the 5th and 95th percentile of the historical return distribution for the AEX (€56.35 and €142.98) and Philips (€53.23 and €196.88), respectively. For the regressions reported in this table, we set them to the 2.5 and 97.5% quantiles (€49.60 and €151.32 for the AEX and €48.54 and €218.58 for Philips) instead.
The table contains OLS regressions of the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.22: Changes in expectations and portfolio dynamics — alternative bounds

	Change in Portfolio Share					
	Δ_{AEX}			$\Delta_{Philips}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.82***	4.79***	4.34***	−1.39	−1.65	−1.81
	(1.52)	(1.52)	(1.43)	(1.45)	(1.45)	(1.45)
$\Delta\mu_{AEX}$	0.44**	0.44**	0.54**			0.25*
	(0.23)	(0.22)	(0.22)			(0.14)
$\Delta\sigma_{AEX}$	−0.42*	−0.42*	−0.16			−0.38
	(0.25)	(0.25)	(0.28)			(0.26)
$\Delta\gamma_{AEX}$		−0.44	−0.04			0.36
		(0.62)	(0.63)			(0.61)
$\Delta\mu_{Philips}$			−0.32***	0.18	0.23*	0.19
			(0.09)	(0.12)	(0.12)	(0.13)
$\Delta\sigma_{Philips}$			0.03	0.33*	0.23	0.34
			(0.16)	(0.18)	(0.19)	(0.21)
$\Delta\gamma_{Philips}$			−0.90***		0.89***	0.82***
			(0.31)		(0.32)	(0.32)
Risk aversion	1.21***	1.18***	1.21***	0.07	0.05	0.06
	(0.34)	(0.33)	(0.33)	(0.36)	(0.35)	(0.35)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	1.95	1.96	4.57	2.84	3.68	4.08

Sources: LISS panel and own calculations. The results in this table differ from those reported in the main text in the assumptions we make concerning the outer bounds for the extreme bins. In the main text, we set them to the values which a €100 investment would have returned at the 5th and 95th percentile of the historical return distribution for the AEX (€56.35 and €142.98) and Philips (€53.23 and €196.88), respectively. For the regressions reported in this table, we set them to the 2.5 and 97.5% quantiles (€49.60 and €151.32 for the AEX and €48.54 and €218.58 for Philips) instead.
The table contains OLS regressions of changes in the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6.1.2 Skew-normal belief distributions

For the analyses in the main text, we fit cubic Hermite splines to approximate the intervals between points on the stated CDF in order to obtain estimates for a respondent's entire belief distribution. The entire distribution was thus a combination of a set of local estimates. As an alternative and to show the robustness of our results, we also fit a skew-normal distribution (Azzalini, 1985) to the entire CDF.

To this end, we first cumulated the number of balls assigned to indvidual bins to again obtain a discrete version of a respondent's stated CDF. Using the 7 interior points of this CDF (p_i for $i \in [85, 90, 95, 100, 105, 110, 115]$), we then minimized

$$\underset{\xi,\omega,\alpha}{\text{minimize}} \quad \sum_i \left(p_i - SKN_i(\xi,\omega,\alpha)\right)^2,$$

the sum of the squared differences to the respective points on the CDF of a skew-normal distribution (SKN_i) with location parameter ξ, scale parameter ω, and shape parameter α. Using the resulting estimates for ξ, ω, and α, we then calculated the mean, standard deviation, and skewness of the skew-normal distribution as

$$\mu^{\text{SKN}} = \xi + \omega\delta\sqrt{\frac{2}{\pi}},$$

$$\sigma^{\text{SKN}} = \omega^2\left(1 - \frac{2\delta^2}{\pi}\right),$$

and

$$\gamma^{\text{SKN}} = \frac{4-\pi}{2}\frac{\left(\delta\sqrt{2/\pi}\right)^3}{\left(1 - 2\delta^2/\pi\right)^{3/2}},$$

where $\delta = \frac{\alpha}{\sqrt{1+\alpha^2}}$. In Table B.23 and Table B.24 we show our main results when we employ these estimates and re-run the static (Table B.23) and dynamic (Table B.24) regressions.

Table B.23: Expectations and portfolio choice — skew-normal beliefs

	Portfolio Share					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	26.95***	27.48***	29.38***	30.62***	31.49***	32.06***
	(3.06)	(3.08)	(3.27)	(2.76)	(2.71)	(2.88)
μ_{AEX}	0.41***	0.28***	0.34***			−0.19
	(0.10)	(0.11)	(0.12)			(0.12)
σ_{AEX}	0.22	0.18	0.27*			0.01
	(0.14)	(0.13)	(0.14)			(0.13)
γ_{AEX}		3.26***	3.60***			−0.36
		(1.31)	(1.35)			(1.26)
μ_{Philips}			−0.02	0.13*	0.09***	0.45***
			(0.11)	(0.08)	(0.04)	(0.09)
σ_{Philips}			−0.17	0.14	0.00	−0.07
			(0.14)	(0.12)	(0.11)	(0.12)
γ_{Philips}			−2.30*		8.56***	6.62***
			(1.26)		(1.00)	(1.15)
Exp. return for savings account			−0.20**			−0.22**
			(0.10)			(0.10)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,841	1,841	1,830	1,842	1,842	1,830
Adjusted R^2 (%)	8.80	9.10	9.70	4.00	7.70	8.30

Sources: LISS panel and own calculations. The results in this table are based on moments of skew-normal distributions fitted to respondents' stated CDFs as described in paragraph B.6.1.2 of this Appendix. The table contains OLS regressions of the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.24: Changes in expectations and portfolio dynamics — skew-normal beliefs

	Change in Portfolio Share					
	Δ_{AEX}			Δ_{Philips}		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	5.33***	5.31***	4.69***	−2.13	−2.00	−1.82
	(1.52)	(1.53)	(1.45)	(1.55)	(1.56)	(1.47)
$\Delta\mu_{\text{AEX}}$	0.17*	0.16*	0.23**			0.01
	(0.09)	(0.10)	(0.10)			(0.10)
$\Delta\sigma_{\text{AEX}}$	−0.01	−0.01	0.06			−0.04
	(0.08)	(0.08)	(0.09)			(0.09)
$\Delta\gamma_{\text{AEX}}$		0.40	0.76			0.69
		(1.45)	(1.47)			(1.57)
$\Delta\mu_{\text{Philips}}$			−0.27**	0.03	0.03	0.47***
			(0.13)	(0.03)	(0.03)	(0.12)
$\Delta\sigma_{\text{Philips}}$			−0.14	0.22*	0.20	0.05
			(0.17)	(0.13)	(0.13)	(0.14)
$\Delta\gamma_{\text{Philips}}$			−2.22*		4.08***	2.48*
			(1.30)		(1.25)	(1.32)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,841	1,841	1,830	1,842	1,842	1,830
Adjusted R^2 (%)	0.90	0.80	2.40	0.40	1.70	3.70

Sources: LISS panel and own calculations. The results in this table are based on moments of skew-normal distributions fitted to respondents' stated CDFs as described in paragraph B.6.1.2 of this Appendix. The table contains OLS regressions of changes in the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6.1.3 Unimodal histograms

The expected return distributions of some respondents in our sample are multimodal, i.e., these respondents' belief histograms contain multiple local maxima. To show that our results are not affected by the presence of such beliefs, we reestimate our main regressions after dropping all respondents whose belief distributions are multimodal. For our purpose, we define multimodality in the following way: First, we round the number of balls in each bin to the nearest multiple of 5. We do this to not be overly strict in defining a local maximum. Then, we check the number of local maxima in the resulting distribution. In this step, we consider consecutive values of equal magnitude part of the same maximum. Some examples:

Keep: $[0.00, 0.00, 0.05, 0.10, 0.15, 0.25, 0.35, 0.10]$ — 1 local max. only

Keep: $[0.00, 0.00, 0.05, 0.15, 0.20, 0.25, 0.25, 0.10]$ — 1 local max. covering 2 bins

Keep: $[0.00, 0.00, 0.05, 0.15, 0.20, 0.19, 0.20, 0.21]$ — 1 local max. covering 4 bins after rounding

Drop: $[0.00, 0.00, 0.05, 0.15, 0.20, 0.15, 0.15, 0.30]$ — 2 local max.

Drop: $[0.15, 0.00, 0.05, 0.60, 0.00, 0.00, 0.00, 0.20]$ — 3 local max.

Table B.25 and Table B.26 present the main results for regressions based on observations with only 1 local maximum in the histogram for the beliefs of the asset under consideration. In Table B.26, we require unimodal belief distributions in both waves.

Table B.25: Expectations and portfolio choice — unimodal histograms

	Portfolio Share					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	28.35***	27.46***	30.45***	26.33***	26.00***	27.83***
	(3.96)	(4.00)	(4.06)	(3.42)	(3.41)	(3.61)
μ_{AEX}	0.95***	0.92***	1.20***			−0.25*
	(0.16)	(0.16)	(0.16)			(0.15)
σ_{AEX}	−0.24	−0.17	0.14			−0.13
	(0.27)	(0.27)	(0.34)			(0.29)
γ_{AEX}		1.13*	1.21*			0.79
		(0.63)	(0.64)			(0.70)
μ_{Philips}			−0.36***	0.34***	0.37***	0.44***
			(0.12)	(0.11)	(0.11)	(0.12)
σ_{Philips}			−0.22	0.34**	0.23	0.31
			(0.20)	(0.17)	(0.17)	(0.22)
γ_{Philips}			0.24		0.91***	0.82***
			(0.38)		(0.33)	(0.33)
Exp. return for savings account			−0.25**			−0.36***
			(0.13)			(0.12)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,391	1,391	1,391	1,441	1,441	1,441
Adjusted R^2 (%)	10.80	10.90	12.90	6.10	6.50	7.10

Sources: LISS panel and own calculations. The results in this table are based on all observations with unimodal histograms for either the AEX (column 1 to 3) or Philips (column 4 to 6) in August 2013.
The table contains OLS regressions of the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.26: Changes in expectations and portfolio dynamics — unimodal histograms

	Change in Portfolio Share					
	Δ_{AEX}			Δ_{Philips}		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.28**	4.25**	3.59**	−2.07	−2.56	−2.65
	(1.83)	(1.83)	(1.70)	(1.71)	(1.71)	(1.70)
$\Delta\mu_{\text{AEX}}$	0.84***	0.84***	0.97***			0.23
	(0.33)	(0.33)	(0.33)			(0.19)
$\Delta\sigma_{\text{AEX}}$	−1.17***	−1.17***	−0.86*			−0.49
	(0.43)	(0.43)	(0.48)			(0.36)
$\Delta\gamma_{\text{AEX}}$		−0.61	−0.14			0.81
		(0.84)	(0.87)			(0.74)
$\Delta\mu_{\text{Philips}}$			−0.43***	0.42***	0.49***	0.40***
			(0.13)	(0.15)	(0.14)	(0.13)
$\Delta\sigma_{\text{Philips}}$			0.11	0.48**	0.22	0.46
			(0.25)	(0.24)	(0.25)	(0.28)
$\Delta\gamma_{\text{Philips}}$			−0.83**		1.13***	1.01***
			(0.43)		(0.40)	(0.39)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,362	1,362	1,362	1,412	1,412	1,412
Adjusted R^2 (%)	4.00	4.00	6.20	4.50	5.50	6.00

Sources: LISS panel and own calculations. The results in this table are based on all observations with unimodal histograms for either the AEX (column 1 to 3) or Philips (column 4 to 6) in both August 2013 and March 2014.
The table contains OLS regressions of changes in the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6.2 Additional controls

B.6.2.1 Experimental controls

The experiments were accompanied by follow-up questions. Following the surveys in August 2013 and September 2013, subjects were asked to use five-point scales to indicate how difficult, how interesting, and how clear they considered our tasks. We scale the average of each variable across both surveys to the range between 0 and 1 and include the results as additional controls for the regressions in Table B.27 and Table B.28.

Table B.27: Expectations and portfolio choice — experimental controls

	Portfolio Share	
	AEX	Philips
	(1)	(2)
Constant	30.54***	30.93***
	(3.55)	(3.17)
μ_{AEX}	0.86***	−0.25**
	(0.11)	(0.12)
σ_{AEX}	0.27	−0.12
	(0.22)	(0.22)
γ_{AEX}	1.13**	0.28
	(0.56)	(0.60)
μ_{Philips}	−0.26***	0.41***
	(0.09)	(0.09)
σ_{Philips}	−0.17	0.18
	(0.14)	(0.14)
γ_{Philips}	0.19	0.93***
	(0.33)	(0.30)
Exp. return for savings account	−0.14	−0.24**
	(0.10)	(0.10)
Experimental tasks difficult	3.25	0.71
	(2.03)	(1.91)
Experimental tasks obscure	−0.60	−5.19*
	(3.00)	(2.82)
Experimental tasks boring	−9.33***	−1.83
	(2.55)	(2.37)
Controls	Yes	Yes
Observations	1,857	1,857
Adjusted R^2 (%)	12.10	7.00

Sources: LISS panel and own calculations. The results in this table extend the main specification by additional controls for the perceived difficulty, boredom, and obscurity of our experimental tasks.
The table contains OLS regressions of the share invested into the AEX (column 1) and Philips (column 2) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.28: Changes in expectations and portfolio dynamics — experimental controls

	Change in Portfolio Share	
	Δ_{AEX}	Δ_{Philips}
	(1)	(2)
Constant	4.45***	–2.46*
	(1.50)	(1.51)
$\Delta\mu_{\text{AEX}}$	0.59***	0.25*
	(0.24)	(0.16)
$\Delta\sigma_{\text{AEX}}$	–0.19	–0.43
	(0.31)	(0.29)
$\Delta\gamma_{\text{AEX}}$	0.06	0.38
	(0.74)	(0.74)
$\Delta\mu_{\text{Philips}}$	–0.38***	0.26*
	(0.10)	(0.14)
$\Delta\sigma_{\text{Philips}}$	0.04	0.40*
	(0.18)	(0.24)
$\Delta\gamma_{\text{Philips}}$	–1.03***	0.99***
	(0.37)	(0.36)
Experimental tasks difficult	0.82	–0.47
	(1.11)	(1.06)
Experimental tasks obscure	–2.64	4.09***
	(1.64)	(1.51)
Experimental tasks boring	0.80	–0.93
	(1.28)	(1.30)
Controls	Yes	Yes
Observations	1,857	1,857
Adjusted R^2 (%)	4.60	4.50

Sources: LISS panel and own calculations. The results in this table extend the main specification by additional controls for the perceived difficulty, boredom, and obscurity of our experimental tasks.
The table contains OLS regressions of changes in the share invested into the AEX (column 1) and Philips (column 2) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6.2.2 Time effects

Table B.29 and Table B.30 add dummies for the week in which the experiment was run in September 2013 (Table B.29) and March 2014 (Table B.30).

Table B.29: Expectations and portfolio choice — date effects

	Portfolio Share	
	AEX	Philips
	(1)	(2)
Constant	29.61***	28.99***
	(4.50)	(4.18)
μ_{AEX}	0.88***	−0.22*
	(0.11)	(0.12)
σ_{AEX}	0.30	−0.14
	(0.22)	(0.22)
γ_{AEX}	1.15**	0.34
	(0.56)	(0.60)
μ_{Philips}	−0.24***	0.43***
	(0.09)	(0.09)
σ_{Philips}	−0.20	0.16
	(0.14)	(0.14)
γ_{Philips}	0.16	0.92***
	(0.33)	(0.30)
Exp. return for savings account	−0.15	−0.26***
	(0.10)	(0.10)
Week 36 2013	−2.65	1.11
	(3.13)	(2.84)
Week 37 2013	−1.74	3.19
	(3.39)	(3.09)
Week 38 2013	2.65	−2.29
	(3.45)	(3.06)
Week 39 2013	0.68	0.52
	(3.30)	(2.98)
Controls	Yes	Yes
Observations	1,857	1,857
Adjusted R^2 (%)	11.70	6.90

Sources: LISS panel and own calculations. The results in this table extend the main specification by additional controls for the week of the experiments in September 2013.
The table contains OLS regressions of the share invested into the AEX (column 1) and Philips (column 2) on the first three moments of both assets' expected return distributions, the point estimate for the return of the savings account, controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion, as well as the above mentioned temporal controls. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

Table B.30: Changes in expectations and portfolio dynamics — date effects

	Change in Portfolio Share	
	Δ_{AEX}	Δ_{Philips}
	(1)	(2)
Constant	4.92***	–3.33**
	(1.73)	(1.63)
$\Delta\mu_{\text{AEX}}$	0.58***	0.27*
	(0.23)	(0.15)
$\Delta\sigma_{\text{AEX}}$	–0.16	–0.46
	(0.31)	(0.29)
$\Delta\gamma_{\text{AEX}}$	0.07	0.36
	(0.74)	(0.73)
$\Delta\mu_{\text{Philips}}$	–0.37***	0.24*
	(0.10)	(0.14)
$\Delta\sigma_{\text{Philips}}$	0.02	0.42*
	(0.18)	(0.24)
$\Delta\gamma_{\text{Philips}}$	–1.03***	0.98***
	(0.36)	(0.35)
Week 10 2014	–1.42	3.04***
	(1.20)	(1.06)
Week 11 2014	–0.44	1.69
	(1.25)	(1.13)
Week 12 2014	0.24	–0.31
	(1.23)	(1.06)
Controls	Yes	Yes
Observations	1,857	1,857
Adjusted R^2 (%)	4.80	5.30

Sources: LISS panel and own calculations. The results in this table extend the main specification by additional controls for the week of the experiments in March 2014.
The table contains OLS regressions of the change in the share invested into the AEX (column 1) and Philips (column 2) on the changes in the first three moments of both assets' expected return distributions, controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion, as well as the above mentioned temporal controls. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6.2.3 Financial numeracy, advice, stock market participation

Table B.31 and Table B.32 show the static and dynamic results when we include financial advice, financial numeracy, and a dummy if the subject holds any stocks or funds as additional control variables. Section B.2 provides definitions for financial numeracy and financial advice. Due to non-response by a small number of respondents in the respective questionnaire and item non-response to the questions about stock market participation, the regressions are based on $1,318$ observations.

Table B.31: Expectations and Portfolio Choice (controlling for financial advice, financial numeracy, has stocks or funds)

	Portfolio Share					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	26.46***	28.03***	28.44***	32.20***	33.54***	32.80***
	(4.29)	(4.42)	(4.08)	(3.95)	(4.18)	(3.81)
μ_{AEX}	0.71***	0.93***	1.02***		−0.21	−0.21
	(0.13)	(0.13)	(0.13)		(0.14)	(0.14)
σ_{AEX}	−0.17	−0.05	0.04		0.07	0.03
	(0.24)	(0.29)	(0.28)		(0.28)	(0.28)
γ_{AEX}	1.18*	1.37**	1.35**		0.30	0.34
	(0.68)	(0.68)	(0.69)		(0.74)	(0.74)
μ_{Philips}		−0.31***	−0.29***	0.42***	0.48***	0.47***
		(0.10)	(0.10)	(0.10)	(0.11)	(0.11)
σ_{Philips}		−0.04	−0.10	0.06	0.02	0.05
		(0.18)	(0.18)	(0.14)	(0.17)	(0.17)
γ_{Philips}		0.01	0.08	1.10***	1.10***	1.03***
		(0.40)	(0.41)	(0.37)	(0.37)	(0.36)
Exp. return for savings account		−0.06	−0.11		−0.30**	−0.29**
		(0.12)	(0.13)		(0.13)	(0.13)
Main source financial advice: internet	1.51	1.32		0.29	0.45	
	(2.13)	(2.12)		(2.01)	(2.00)	
Main source financial advice: newspaper/books	7.89***	7.75***		−4.66**	−4.60*	
	(2.66)	(2.65)		(2.42)	(2.40)	
Main source financial advice: parents/friends	−0.39	−0.60		−1.43	−1.34	
	(1.88)	(1.88)		(1.84)	(1.83)	
Main source financial advice: other	0.96	0.82		−2.15	−1.89	
	(2.20)	(2.20)		(2.15)	(2.15)	
Financial numeracy	0.94	0.95		−0.46	−0.69	
	(0.75)	(0.75)		(0.74)	(0.75)	
Holds stocks or funds	7.00***	6.62***		0.15	0.56	
	(2.22)	(2.20)		(2.02)	(2.04)	
Risk aversion	−1.65**	−1.63**	−2.05***	−3.29***	−3.37***	−3.47***
	(0.76)	(0.75)	(0.76)	(0.72)	(0.72)	(0.72)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,318	1,318	1,318	1,318	1,318	1,318
Adjusted R^2 (%)	11.69	12.73	11.30	6.77	7.04	7.04

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 4, but additonally adds as independent variables financial advice, financial numeracy, and a dummy if the subject holds any stocks or funds. In columns 3 and 6, the sample is restricted to the 1318 observations for which we have complete information for all additional variables. Left out category for financial advice: Professional

Table B.32: Changes in Expectations and Portfolio Dynamics (controlling for financial advice, financial numeracy, has stocks or funds)

	Change in Portfolio Share					
	Δ_{AEX}			Δ_{Philips}		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.32*	3.30*	4.51***	−1.62	−1.81	−1.91
	(2.03)	(1.94)	(1.67)	(2.03)	(2.03)	(1.77)
$\Delta\mu_{\text{AEX}}$	0.47	0.65**	0.68**		0.39**	0.38**
	(0.30)	(0.31)	(0.31)		(0.19)	(0.19)
$\Delta\sigma_{\text{AEX}}$	−0.64**	−0.56	−0.60		−0.06	−0.06
	(0.33)	(0.38)	(0.38)		(0.34)	(0.35)
$\Delta\gamma_{\text{AEX}}$	0.17	0.59	0.63		−0.16	−0.21
	(0.84)	(0.89)	(0.88)		(0.81)	(0.80)
Risk aversion	1.00**	1.08***	1.16***	0.16	0.10	0.15
	(0.42)	(0.41)	(0.39)	(0.43)	(0.42)	(0.43)
$\Delta\mu_{\text{Philips}}$		−0.36***	−0.38***	0.35***	0.28***	0.28***
		(0.11)	(0.11)	(0.11)	(0.11)	(0.12)
$\Delta\sigma_{\text{Philips}}$		0.31	0.32*	0.03	0.13	0.14
		(0.19)	(0.20)	(0.17)	(0.19)	(0.19)
$\Delta\gamma_{\text{Philips}}$		−1.47***	−1.49***	1.22***	1.11***	1.09***
		(0.41)	(0.41)	(0.37)	(0.37)	(0.37)
Main source financial advice: internet	3.41***	3.42***		−1.35	−1.33	
	(1.26)	(1.24)		(1.19)	(1.19)	
Main source financial advice: newspaper/books	1.17	1.04		1.94	1.94	
	(1.23)	(1.22)		(1.24)	(1.23)	
Main source financial advice: parents/friends	0.48	0.45		0.46	0.46	
	(1.00)	(0.99)		(1.00)	(1.00)	
Main source financial advice: other	−0.10	0.11		0.22	0.33	
	(1.03)	(1.03)		(1.11)	(1.11)	
Financial numeracy	1.13***	1.04***		−0.52	−0.62*	
	(0.34)	(0.34)		(0.37)	(0.37)	
Holds stocks or funds	−1.82	−1.58		−0.68	−0.51	
	(1.16)	(1.14)		(1.07)	(1.07)	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,318	1,318	1,318	1,318	1,318	1,318
Adjusted R^2 (%)	2.91	5.52	4.46	3.53	4.06	3.83

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 5, but additonally adds as independent variables financial advice, financial numeracy, and a dummy if the subject holds any stocks or funds. In columns 3 and 6, the sample is restricted to the 1318 observations for which we have complete information for all additional variables. Left out category for financial advice: Professional

B.6.2.4 Portfolio dynamics and the expected return for the savings account

The regressions in Table 5 of the main text do not include the expected return for the savings account as a predictor for changes in portfolio compositions. Table B.33 shows the results when we add this variable. The main coefficients are almost unchanged and the coefficient of the expected return for the savings account is not significantly different from zero.

Table B.33: Changes in expectations and portfolio dynamics — adding the expected return for the savings account

	Change in Portfolio Share					
	Δ_{AEX}			$\Delta_{Philips}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.87***	4.84***	4.36***	−1.54	−1.79	−1.96
	(1.58)	(1.58)	(1.48)	(1.47)	(1.47)	(1.47)
Exp. return for savings account	−0.01	−0.01	−0.01	0.03	0.03	0.03
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$\Delta\mu_{AEX}$	0.46**	0.46**	0.58***			0.26*
	(0.24)	(0.23)	(0.24)			(0.16)
$\Delta\sigma_{AEX}$	−0.47*	−0.48*	−0.18			−0.43
	(0.27)	(0.27)	(0.31)			(0.29)
$\Delta\gamma_{AEX}$		−0.38	0.06			0.37
		(0.72)	(0.74)			(0.74)
$\Delta\mu_{Philips}$			−0.38***	0.25**	0.32**	0.27**
			(0.10)	(0.13)	(0.13)	(0.14)
$\Delta\sigma_{Philips}$			0.04	0.36*	0.24	0.39
			(0.18)	(0.21)	(0.21)	(0.24)
$\Delta\gamma_{Philips}$			−1.03***		1.06***	0.99***
			(0.37)		(0.36)	(0.36)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	1.90	1.90	4.60	3.00	3.90	4.30

Sources: LISS panel and own calculations. The results in this table extend the main specification by including the expected return for the savings account as an additional control.
The table contains OLS regressions of changes in the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6.2.5 Portfolio Returns after 6 Months

Table B.34 shows the dynamic main analyses controling for the portfolio returns during the first 6 months.

Table B.34: Controlling for Portfolio Returns after 6 Months

	Change in Portfolio Share					
	Δ_{AEX}			$\Delta_{Philips}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	7.64***	7.62***	7.01***	−2.68*	−2.91**	−3.07**
	(1.50)	(1.50)	(1.40)	(1.45)	(1.45)	(1.45)
$\Delta\mu_{AEX}$	0.51**	0.51**	0.61***			0.25
	(0.22)	(0.22)	(0.22)			(0.16)
$\Delta\sigma_{AEX}$	−0.43*	−0.44*	−0.13			−0.45
	(0.26)	(0.26)	(0.30)			(0.29)
Risk aversion	0.92***	0.90***	0.94***	0.19	0.18	0.19
	(0.33)	(0.33)	(0.32)	(0.35)	(0.35)	(0.35)
$\Delta\gamma_{AEX}$		−0.34	0.08			0.37
		(0.69)	(0.71)			(0.73)
$\Delta\mu_{Philips}$			−0.32***	0.22*	0.29**	0.24*
			(0.10)	(0.13)	(0.14)	(0.14)
$\Delta\sigma_{Philips}$			−0.03	0.39*	0.27	0.42*
			(0.18)	(0.21)	(0.22)	(0.24)
$\Delta\gamma_{Philips}$			−1.01***		1.05***	0.98***
			(0.35)		(0.35)	(0.35)
Portfolio return after 6 months	−1.33***	−1.33***	−1.26***	0.60***	0.59***	0.59***
	(0.18)	(0.18)	(0.17)	(0.17)	(0.17)	(0.17)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	5.83	5.80	8.07	3.78	4.69	5.07

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 5, but controls for the portfolio returns during the first 6 months.

B.6.3 Alternative Specifications

Tables B.35 and B.36 replicate the main analyses with three alternative specifications: In column 1 and 2, no control variables are added. In columns 3 and 4, a Tobit regression is run instead of an OLS regression. Finally, in the last columns the variance of the assets is used in the specification instead of the standard deviation. The main effects are not affected and still significant – in one case only at the 10 % level (for the relation of skewness expectations of the AEX on investment in the AEX in the regression without controls: column 1 in Table B.35).

Table B.37 shows a regression of the AEX's relative share in total risky investments (i.e., AEX and Philips) on the differences in perceived means, standard deviations, and skewness. Both the difference in perceived means and the difference in perceived skewness are significant in the expected direction (the latter at the 10% level), while the difference in perceived standard deviations is not. When we regress the change of the share of AEX of total risky investments on changes in the differences in perceived means, standard deviations, and skewness, a similar picture emerges. The changes in the difference in perceived means and perceived skewness are significantly correlated with changes in the share of the AEX of total risky investments. Again, we find no significant coefficient for the change in the difference in perceived standard deviations. Taken together, these analyses suggest that the differences between the two assets in expected mean and skewness matter for the relative weight an asset receives in the risky part of the portfolio.

Table B.35: Expectations and Portfolio Choice — alternative specifications

	Portfolio Share					
	No controls		Tobit		Variance instead of Std	
	AEX	Philips	AEX	Philips	AEX	Philips
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	34.39***	29.15***	25.90***	27.43***	28.54***	29.97***
	(1.74)	(1.62)	(4.05)	(3.64)	(3.12)	(2.80)
μ_{AEX}	1.12***	–0.17	1.01***	–0.28**	0.87***	–0.23**
	(0.12)	(0.11)	(7.70)	(2.39)	(0.11)	(0.12)
σ_{AEX}	0.11	–0.10	0.28	–0.12		
	(0.22)	(0.22)	(1.08)	(0.52)		
σ^2_{AEX}					1.64	–0.32
					(1.16)	(1.10)
γ_{AEX}	0.99*	0.31	1.41**	0.27	1.24**	0.33
	(0.57)	(0.61)	(2.04)	(0.43)	(0.56)	(0.59)
μ_{Philips}	–0.24***	0.43***	–0.31***	0.51***	–0.25***	0.45***
	(0.09)	(0.10)	(3.23)	(5.90)	(0.09)	(0.10)
σ_{Philips}	–0.25*	0.13	–0.18	0.18		
	(0.14)	(0.15)	(1.04)	(1.13)		
$\sigma^2_{\text{Philips}}$					–0.47	0.24
					(0.47)	(0.49)
γ_{Philips}	0.16	1.02***	0.34	1.10***	0.11	0.96***
	(0.34)	(0.31)	(0.80)	(2.91)	(0.33)	(0.30)
Exp. return for savings account			–0.17	–0.25**	–0.17*	–0.25***
			(1.18)	(1.97)	(0.10)	(0.10)
Risk aversion			–2.95***	–4.01***	–2.43***	–3.45***
			(3.87)	(5.84)	(0.62)	(0.59)
Controls	No	No	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	6.21	3.76	1.40	0.95	11.41	6.72

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 4, but with three alternative specifications: In column 1 and 2, no control variables are added. In columns 3 and 4, a Tobit regression is run instead of an OLS regression. In column 5 and 6, the variance of the assets is used in the specification instead of the standard deviation.

Table B.36: Changes in expectations and portfolio dynamics — alternative specifications

	Portfolio Share					
	No controls		Tobit		Variance instead of Std	
	AEX (1)	Philips (2)	AEX (3)	Philips (4)	AEX (5)	Philips (6)
Constant	2.13***	−0.12	4.29***	−1.80	4.46***	−1.98
	(0.33)	(0.30)	(1.50)	(1.46)	(1.44)	(1.47)
$\Delta\mu_{\text{AEX}}$	0.60***	0.25	0.59***	0.26**	0.62***	0.22
	(0.24)	(0.16)	(5.58)	(2.51)	(0.23)	(0.16)
$\Delta\sigma_{\text{AEX}}$	−0.17	−0.42	−0.19	−0.42**		
	(0.31)	(0.29)	(0.85)	(1.98)		
$\Delta\sigma^2_{\text{AEX}}$					−0.59	−2.11*
					(1.50)	(1.28)
$\Delta\gamma_{\text{AEX}}$	0.02	0.23	0.06	0.38	0.09	0.33
	(0.75)	(0.74)	(0.12)	(0.82)	(0.75)	(0.74)
$\Delta\mu_{\text{Philips}}$	−0.38***	0.27**	−0.38***	0.27***	−0.46***	0.32**
	(0.10)	(0.14)	(5.74)	(4.06)	(0.10)	(0.16)
$\Delta\sigma_{\text{Philips}}$	0.01	0.38	0.04	0.39***		
	(0.18)	(0.24)	(0.29)	(3.28)		
$\Delta\sigma^2_{\text{Philips}}$					0.78	0.75
					(0.52)	(0.93)
$\Delta\gamma_{\text{Philips}}$	−1.00***	0.95***	−1.03***	0.99***	−1.05***	1.17***
	(0.37)	(0.36)	(4.08)	(4.00)	(0.35)	(0.35)
Risk aversion			1.22***	0.06	1.23***	0.05
			(3.68)	(0.19)	(0.32)	(0.35)
Controls	No	No	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	4.09	4.30	0.72	0.68	11.41	6.72

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 5, but with three alternative specifications: In column 1 and 2, no control variables are added. In columns 3 and 4, a Tobit regression is run instead of an OLS regression. In column 5 and 6, the variance of the assets is used in the specification instead of the standard deviation.

Table B.37: Explain total share of risky investments and share in AEX of risky investments (experimental task)

	Share Risky Assets (AEX + Philips) (1)	Difference AEX - Philips (2)	Change Difference AEX - Philips (3)	Share AEX of Risky Assets (4)	Change in Share AEX of Risky Assets (5)
Constant	58.41***	0.60	6.32***	47.52***	4.42***
	(3.78)	(4.64)	(2.57)	(3.20)	(1.67)
μ_{AEX}	0.64***				
	(0.12)				
σ_{AEX}	0.15				
	(0.23)				
γ_{AEX}	1.53***				
	(0.59)				
μ_{Philips}	0.19*				
	(0.10)				
σ_{Philips}	−0.04				
	(0.16)				
γ_{Philips}	1.08***				
	(0.37)				
$\mu_{\text{AEX}} - \mu_{\text{Philips}}$		0.77***		0.54***	
		(0.13)		(0.09)	
$\sigma_{\text{AEX}} - \sigma_{\text{Philips}}$		0.16		0.04	
		(0.22)		(0.15)	
$\gamma_{\text{AEX}} - \gamma_{\text{Philips}}$		0.86*		0.84***	
		(0.48)		(0.34)	
$\Delta\mu_{\text{AEX}} - \Delta\mu_{\text{Philips}}$			0.57***		0.38***
			(0.18)		(0.11)
$\Delta\sigma_{\text{AEX}} - \Delta\sigma_{\text{Philips}}$			0.45		0.13
			(0.35)		(0.19)
$\Delta\gamma_{\text{AEX}} - \Delta\gamma_{\text{Philips}}$			1.60***		1.42***
			(0.60)		(0.42)
Exp. return for savings account	−0.42***	0.10	−0.04	0.01	0.01
	(0.13)	(0.16)	(0.08)	(0.11)	(0.06)
Risk aversion	−5.90***	0.74	1.22**	0.23	1.58***
	(0.71)	(0.98)	(0.58)	(0.68)	(0.41)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,751	1,749
Adjusted R^2 (%)	14.82	6.26	4.17	7.66	4.57

Sources: LISS panel and own calculations. In the first column, the dependent variable is the sum of the share invested in the AEX and in Philips. In columns 2 the difference between the share invested in the AEX and the share invested in Philips is used (for column 3, the change in this measure between the two elicitations is calculated). In columns 4 and 5, the fraction of investment into the AEX of the total invested in either AEX or Philips is considered. All outcome variables are multiplied by 100 to simplify presentation of coefficients.

B.6.4 Split by Holding Stocks or Funds

In the survey, we asked participants to provide information on their investments in the following four asset groups: riskless assets (banking accounts, saving accounts), stocks, funds, and other risky financial assets (e.g., bonds). Using this information, we repeat our main analyses with a specific focus on whether a participant had any experience in stock markets, proxied by an indicator variable indicating whether the participant has any assets invested in stocks or funds, which was the case for 25% of the sample.

In Table B.38, we regress portfolio shares in the AEX and Philips, respectively, on the moments of participants' expectations interacted with an stock market investor dummy. We detect no clear pattern in the coefficients for the interaction terms between the stock market investor dummy and skewness expectations. The signs of the respective coefficients are mixed and neither of the coefficients is statistically significant. However, the results suggest that mean expectations for Philips tend to be more strongly associated with portfolio shares for participants that invest in the stock market, both for the share invested in the AEX (negatively) and the share invested in Philips (positively). This finding suggests that individuals with stock market experience pay more attention to expected returns in their investment decisions.

In Table B.39, we replicate the exercise for the relation between changes in expectations and changes in portfolio choice, i.e., we interact the stock market investor dummy with the changes in the belief parameters. Again, the interactions between investing in the stock market and changes in skewness expectations are not statistically significant for both assets. Overall, these analyses do not suggest that the relation of portfolio choice and skewness expectations differs by much between participants who invest or do not invest in the stock market with the caveat that we may not have enough data and power to thoroughly analyze heterogeneous effects.

Table B.38: Expectations and Portfolio Choice – split by Holding Stocks or Funds

	Portfolio Share					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	27.51***	26.67***	28.25***	30.64***	29.36***	31.15***
	(3.75)	(3.79)	(3.96)	(3.33)	(3.34)	(3.64)
μ_{AEX}	0.73***	0.71***	0.80***			–0.23
	(0.14)	(0.14)	(0.14)			(0.16)
σ_{AEX}	–0.01	0.06	0.21			–0.10
	(0.24)	(0.24)	(0.29)			(0.28)
Holds stocks or funds	8.45*	8.45*	6.55	–1.77	0.15	0.91
	(4.75)	(4.71)	(4.67)	(3.32)	(3.60)	(4.47)
μ_{AEX} × Holds stocks or funds	0.09	0.10	0.42			–0.12
	(0.31)	(0.31)	(0.28)			(0.29)
σ_{AEX} × Holds stocks or funds	–0.26	–0.29	0.26			0.12
	(0.60)	(0.60)	(0.69)			(0.69)
γ_{AEX}		1.13*	1.16*			0.36
		(0.67)	(0.68)			(0.76)
γ_{AEX} × Holds stocks or funds		0.54	1.11			–1.18
		(1.91)	(1.89)			(1.96)
μ_{Philips}			–0.10	0.26***	0.29***	0.34***
			(0.10)	(0.10)	(0.10)	(0.10)
σ_{Philips}			–0.11	0.13	0.08	0.11
			(0.18)	(0.15)	(0.15)	(0.17)
γ_{Philips}			0.12		1.26***	1.24***
			(0.41)		(0.38)	(0.38)
Exp. return for savings account			–0.16			–0.26**
			(0.12)			(0.12)
μ_{Philips} × Holds stocks or funds			–0.68***	0.59***	0.56***	0.62***
			(0.23)	(0.22)	(0.22)	(0.24)
σ_{Philips} × Holds stocks or funds			–0.17	–0.09	–0.04	–0.07
			(0.41)	(0.34)	(0.33)	(0.42)
γ_{Philips} × Holds stocks or funds			–0.03		–1.39	–1.13
			(1.05)		(0.92)	(0.92)
Exp. return for savings account × Holds stocks or funds			0.61			–0.34
			(0.45)			(0.44)
Risk aversion	–1.96***	–1.99***	–2.08***	–2.97***	–2.96***	–3.11***
	(0.74)	(0.74)	(0.73)	(0.70)	(0.69)	(0.69)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,454	1,454	1,454	1,454	1,454	1,454
Adjusted R^2 (%)	11.25	11.37	13.11	6.51	6.99	7.22

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 4, but beliefs are interacted with a dummy indicating if the subject owns any stocks or funds.

Table B.39: Changes in Expectations and Portfolio Dynamics – split by Holding Stocks or Funds

	Change in Portfolio Share					
	Δ_{AEX}			Δ_{Philips}		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	5.49***	5.51***	5.21***	−1.66	−1.91	−2.10
	(1.82)	(1.82)	(1.69)	(1.70)	(1.69)	(1.71)
$\Delta\mu_{\text{AEX}}$	0.29	0.29	0.45*			0.43
	(0.23)	(0.23)	(0.25)			(0.27)
$\Delta\sigma_{\text{AEX}}$	−0.99***	−0.98***	−0.73*			0.17
	(0.38)	(0.38)	(0.44)			(0.41)
Holds stocks or funds	−1.57	−1.56	−1.63	−0.33	−0.28	−0.64
	(1.27)	(1.25)	(1.28)	(1.12)	(1.11)	(1.07)
$\Delta\mu_{\text{AEX}}$ × Holds stocks or funds	0.53	0.52	0.52			−0.11
	(0.68)	(0.65)	(0.64)			(0.34)
$\Delta\sigma_{\text{AEX}}$ × Holds stocks or funds	1.43*	1.46*	1.42			−1.47*
	(0.83)	(0.84)	(0.95)			(0.78)
$\Delta\gamma_{\text{AEX}}$		0.62	1.00			−0.20
		(0.90)	(0.96)			(0.92)
$\Delta\gamma_{\text{AEX}}$ × Holds stocks or funds		−2.80	−2.77			0.62
		(1.78)	(1.76)			(1.38)
$\Delta\mu_{\text{Philips}}$			−0.34***	0.26**	0.33***	0.26*
			(0.14)	(0.13)	(0.13)	(0.14)
$\Delta\sigma_{\text{Philips}}$			0.15	0.28	0.16	0.26
			(0.24)	(0.21)	(0.21)	(0.25)
$\Delta\gamma_{\text{Philips}}$			−1.14***		0.91**	0.76*
			(0.46)		(0.41)	(0.41)
$\Delta\mu_{\text{Philips}}$ × Holds stocks or funds			−0.07	−0.01	0.01	0.05
			(0.20)	(0.20)	(0.19)	(0.19)
$\Delta\sigma_{\text{Philips}}$ × Holds stocks or funds			−0.11	−0.16	−0.15	0.02
			(0.42)	(0.35)	(0.33)	(0.39)
$\Delta\gamma_{\text{Philips}}$ × Holds stocks or funds			−0.70		0.88	0.88
			(0.86)		(0.88)	(0.85)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,454	1,454	1,454	1,454	1,454	1,454
Adjusted R^2 (%)	2.62	2.79	5.05	2.22	3.33	3.96

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 5, but beliefs are interacted with a dummy indicating if the subject owns any stocks or funds.

B.6.5 Data from March 2014

Table B.40 repeats the cross-sectional analysis for the data collection during the second elicitation in March 2014.

Table B.40: Expectations and Portfolio Choice (Data from March 2014)

	Portfolio Share (after updating)					
	AEX			Philips		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	35.09***	34.45***	36.14***	27.00***	26.46***	27.35***
	(3.00)	(3.02)	(3.07)	(2.36)	(2.39)	(2.60)
μ_{AEX}	1.00***	0.98***	1.15***			−0.34***
	(0.12)	(0.12)	(0.13)			(0.12)
σ_{AEX}	−0.47***	−0.44**	0.08			0.29
	(0.19)	(0.19)	(0.23)			(0.22)
γ_{AEX}		1.27**	1.37***			0.05
		(0.56)	(0.56)			(0.58)
μ_{Philips}			−0.22**	0.39***	0.40***	0.56***
			(0.11)	(0.11)	(0.10)	(0.11)
σ_{Philips}			−0.48***	0.14	0.09	−0.07
			(0.15)	(0.11)	(0.11)	(0.14)
γ_{Philips}			0.31		0.68**	0.73***
			(0.33)		(0.29)	(0.29)
Exp. return for savings account			−0.11			−0.23***
			(0.10)			(0.09)
Risk aversion	−1.19**	−1.16*	−1.15**	−3.24***	−3.23***	−3.41***
	(0.61)	(0.60)	(0.60)	(0.55)	(0.54)	(0.54)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	12.49	12.68	14.18	6.47	6.69	7.37

Sources: LISS panel and own calculations. The results in this table use the main specification of Table 4, but uses both investment shares and belief parameters from the second elicitation in March 2014. The table contains OLS regressions of changes in the share invested into the AEX (column 1 to 3) and Philips (column 4 to 6) on varying sets of covariates. In addition to the variables shown in the table, the regressions include controls for gender, age, education, marital status, children, income, financial wealth, and risk aversion. Section A.6 defines all controls that have not been defined in the main text. Heteroskedasticity-robust standard errors are reported in parentheses.

B.6.6 Piecewise Regression

In Table B.41 we replicate the static main regression and include separate terms for positive and negative skewness. We also replicate the dynamic analysis (Table B.42) in a similar fashion where we include separate terms for positive and negative changes of skewness.

In both static regressions, all coefficients are as expected; positive skewness is associated with an increase in the portfolio share of an asset, whereas negative skewness is associated with a reduction. With the exception of positive skewness for the AEX, all coefficients are significant at the 10% level or less. In both cases, the coefficient for negative skewness is larger than the one for positive skewness, suggesting a potentially stronger influence of negative skewness. However, Wald tests (p-values: 0.23 (AEX column 1), 0.41 (AEX column 2), 0.43 (Philips column 3), and 0.19 (Philips column 4)) indicate that the respective coefficients for the positive and negative terms do not significantly differ from each other.

In the dynamic regressions, all coefficients again have the expected direction. As in our main specification, changes in skewness (positive or negative) is not significantly related to changes in investment in the AEX. For Philips, both coefficients are positive and significant. Wald tests (p-values: 0.46 (AEX column 1), 0.96 (AEX column 2), 0.68 (Philips column 3), and 0.67 (Philips column 4)) indicate that the two coefficients are not significantly different from each other for all specifications. The results thus do not provide strong evidence concerning differential effects of positive and negative skewness.

Table B.41: Expectations and Portfolio Choice

	Portfolio Share			
	AEX		Philips	
	(1)	(2)	(3)	(4)
Constant	27.91***	29.92***	28.08***	28.25***
	(3.49)	(3.62)	(2.93)	(3.19)
μ_{AEX}	0.68***	0.86***		–0.21*
	(0.11)	(0.11)		(0.12)
σ_{AEX}	–0.02	0.23		–0.02
	(0.20)	(0.23)		(0.22)
γ_{AEX} +	0.42	0.74		1.59*
	(0.85)	(0.86)		(0.84)
γ_{AEX} -	2.36**	2.08*		–2.21
	(1.09)	(1.10)		(1.44)
μ_{Philips}		–0.23***	0.38***	0.43***
		(0.09)	(0.09)	(0.09)
σ_{Philips}		–0.20	0.10	0.12
		(0.14)	(0.12)	(0.14)
γ_{Philips} +		0.09	0.75**	0.64*
		(0.39)	(0.36)	(0.36)
γ_{Philips} -		0.87	2.13	2.75*
		(1.51)	(1.57)	(1.44)
Exp. return for savings account		–0.17*		–0.25***
		(0.10)		(0.10)
Controls	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	10.22	11.34	6.38	6.99

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 4, but include separate terms for positive and negative skewness.

Table B.42: Changes in Expectations and Portfolio Dynamics

	Change in Portfolio Share			
	Δ_{AEX}		Δ_{Philips}	
	(1)	(2)	(3)	(4)
Constant	4.63***	4.24***	−1.67	−1.57
	(1.49)	(1.41)	(1.44)	(1.43)
$\Delta\mu_{\text{AEX}}$	0.44*	0.57**		0.30*
	(0.25)	(0.25)		(0.16)
$\Delta\sigma_{\text{AEX}}$	−0.40	−0.16		−0.53*
	(0.27)	(0.31)		(0.29)
$\Delta\gamma_{\text{AEX}}$ +	0.40	0.13		−1.18
	(1.25)	(1.25)		(1.04)
$\Delta\gamma_{\text{AEX}}$ -	−0.92	0.04		1.49
	(1.07)	(1.16)		(1.21)
$\Delta\mu_{\text{Philips}}$		−0.38***	0.32**	0.26*
		(0.10)	(0.13)	(0.14)
$\Delta\sigma_{\text{Philips}}$		0.06	0.27	0.38
		(0.19)	(0.23)	(0.25)
$\Delta\gamma_{\text{Philips}}$ +		−0.71	1.31*	1.24*
		(0.75)	(0.70)	(0.69)
$\Delta\gamma_{\text{Philips}}$ -		−1.18***	0.95**	0.85*
		(0.47)	(0.47)	(0.48)
Controls	Yes	Yes	Yes	Yes
Observations	1,857	1,857	1,857	1,857
Adjusted R^2 (%)	1.96	4.59	3.91	4.50

Sources: LISS panel and own calculations. The results in this table replicate the main specification of Table 5, but include separate terms for positive and negative changes of skewness.